EDUCATION FOR INDUSTRY AND COMMERCE IN ENGLAND

BY

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WITH AN INTRODUCTION BY

THE RIGHT HONOURABLE

LORD EUSTACE PERCY

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INTRODUCTION

IT is a bold scholar who ventures to write an introduction to his master's thesis, and all the little I know of technical education has been learned under Mr. Abbott's tuition For more than thirty years he has had unrivalled opportunities of studying the educational needs of modern industry; and, both as Chief Technical Inspector of the Board of Education and in his work for the Department of Scientific and Industrial Research, he has been closely identified with the new movement in technical education and industrial research which has been so marked a feature of the years since the war. That movement has, moreover, owed much to his wise and enthusiastic guidance. This book is, therefore, the fruit of long experience and deep knowledge, and I am no Goblin Page to dare to meddle rashly with the black volume of Michael Scott.

But this at least I must say about it. It is not simply a new educational treatise, written for the delectation of that mysterious class of human beings commonly known as 'educationists'. It is a practical study of the most serious social problem that confronts this country, in common with the whole industrial world, at the present moment. The brutal truth is that, while, as Pascal said long ago, a man's choice of his trade is the most important thing in his life, this crucial choice is about the one thing for which our public system of education has made hardly any attempt to prepare its pupils. This is surely one of the craziest phenomena of a crazy world. Ever since the Factory Acts we have been obsessed by the dangers which attend the entry of young people into what is called 'organized industry'. We have seen that such industry, in its effect upon the rising generation,

presents a series of problems almost wholly different from those involved in the relation between master and apprentice in the old crafts. Yet, broadly speaking, we have been content to dam back the flow of juvenile labour into industry by an embankment built up to a certain age level. We discuss frequently whether that level should not be raised by another year, but, the more ardently we argue about the raising of the school-leaving age, the less do we apparently concern ourselves with the subsequent helter-skelter rush of these barraged waters over the countryside below. If we find them later damaging standing crops or losing themselves in stagnant pools, we curse 'industry' or the 'social system', but it hardly occurs to us that industry cannot be expected to divert down nicely ordered channels what is discharged upon it in such unconsidered volume. The revolutionary changes in world economic conditions since the war have greatly accentuated the danger. Old customary methods of recruitment for industry, impossible to schedule on paper, but well enough understood by the working population in each locality, have broken down. The consequent dislocation has been temporarily concealed during the last few years by the relatively small supply of juvenile labour, resulting from the low birth-rate of the war years, but its full extent is now about to be revealed when the children born in 1919 and 1920 begin to enter the labour market.

It would not be true, of course, to say that we have neglected technical education in this country. Mr. Abbott's book sufficiently disproves that common criticism. Certainly, it would be unjust to under-estimate the very real revival of interest in the ideas of vocational training and vocational guidance which has manifested itself among teachers and among all those responsible

for our public and for our private education during the last few years. But the point is that until recently our technical education has had little or no connexion with our elementary and secondary education, and that the actual entry of the child into industry—his actual choice of trade, if it can be dignified by that title—has taken place, as it were, in the gap between these two distinct categories of schools, and he has, therefore, usually had to make the transition without educational guidance of any kind. It follows that the new interest now being shown in vocational education and vocational guidance marks a radical change of outlook, which can only become effective if it succeeds in bringing about a radical change in our whole educational system.

A sound educational system must be based on the realization of one simple fact: that education, in the sense of the preparation of the immature human being for the responsibilities of life, must continue at least up to the age of eighteen; and that this educational process must be conceived as a whole, not only, as now, for the child who passes direct from the elementary into the secondary school and stays at that school until the age of eighteen, but also for the child who passes into the factory at fourteen or fifteen from the senior elementary school, or at sixteen from the secondary school, and then comes under the influence of the technical school or college. Actual schooling may play only a minor part in the later years of this educational process, but schooling is not the whole of education, and it is only the narrow and inefficient school that presumes to depreciate the education which can be acquired outside its walls. Indeed, it is probable that the ordinary school, whether elementary or secondary, can never itself give much direct guidance to its pupils in their choice of a

trade. What it can do is to co-operate with other agencies outside its walls in supplying this glaring deficiency in our scheme of education.

This wastage of human material is, of course, only one aspect of the problem of technical education. The other aspect is that of industrial efficiency in a scientific and severely competitive age, which calls for continual improvement in the technical equipment of the industrial worker. Mr. Abbott deals with both aspects, but he would probably agree that the first is the more important. The far-reaching reforms which he advocates require the driving force of an awakened public opinion, and those who seek to awaken it will find their most powerful arguments, not in purely economic considerations, but in the idea of human salvage. This book might well be dedicated to the 'foiled circuitous wanderers' who to-day often issue from our schools into industrial life, and to the hope of a future system, both in education and in industry, which will at least guarantee to all the children of the nation—not merely, in the old cant phrase, 'an education suited to their abilities'—but expert and sympathetic guidance in choosing a profession and adequate training for the skilled exercise of that profession.

EUSTACE PERCY

PREFACE

IN this account of the English system of preparing young people for careers in industry and commerce, I have thought it desirable to describe, as accurately as I can, its evolution during the period from the Industrial Revolution until the present time.

It was almost inevitable that I should adopt this plan. It happens that I was in very close contact with technical education throughout that very active phase of development which succeeded the passing of the Education Act of 1902. Looking back on this phase and seeing it now, I hope, in something like proper perspective, it is natural for me to try to trace the origin and growth of the movements which have characterized it. But, quite apart from this personal reason, there are other cogent reasons for treating the subject historically. The first is that a picture of the system as it exists at any moment would not represent it correctly, since it is not static but is swiftly changing and developing.

But my strongest reason for tracing the history of vocational education is the conviction that in this country no sound progress can be made unless we have proper regard for the past. Even if our system of vocational education compares unfavourably in some respects with that of other countries—as it most certainly does—this is no reason for abandoning our traditions and substituting methods which have been found successful elsewhere. I do not suggest that we have nothing to learn from our continental neighbours. On the contrary, I am sure that they have many lessons to teach us: but in applying the knowledge we gain from them, we must never forget that our conditions, our outlook, and our habit of mind are different from theirs.

Throughout this book I have emphasized the intimate relationship which exists between general and vocational education and have attempted to indicate my view that they are two complementary parts of what is in fact a single process, established and carried out by the community for the purpose of preparing each generation as it grows up for doing its work in the world with satisfaction to its members and benefit to the nation.

I am conscious of a very serious deficiency in the account I have given of the system of vocational education in England, since I have made only very slight references to the work done by Art Schools. I greatly regret this omission, as I believe that these schools are playing an important part in our scheme of national education: and it seems to me that in the future their work will be even more necessary than it is now, since many of the goods we manufacture will depend more and more on their artistic qualities for their sale overseas. It is not because I do not recognize the value, and indeed the vital necessity, of fostering sound training in art that I have refrained from adding a chapter on the work of the Art Schools: it is simply because I do not feel competent to write such a chapter.

Finally, although the responsibility for all the statements of fact and opinions in this book is mine, I am bound to acknowledge with gratitude the debt I owe to a very large number of persons interested in education for industry and commerce by whom I have been guided and influenced during a long official life.

From my former colleagues at the Board of Education —both administrative officers and H.M. Inspectors of Technical Schools—I have always received that friendly help and frank criticism which is usually given by one member of a family to another; and I hope I have bene-

fited by it. I have received the same help—but perhaps not the same frank criticism—from teachers and administrative officers, as well as from men engaged in trade and industry, and I am very sensible of the debt I owe to them. I ought to acknowledge too the great assistance given to me by the officials and teachers concerned with vocational training in France, Belgium, Holland, Sweden, and Czechoslovakia: and I would urge that there should be more frequent interchange of visits between English and continental officials and teachers than has hitherto existed. Fortunately, there has recently been established in Paris an International Bureau for Technical Education, in which the Governments of nearly all the more important industrial countries of Europe are represented, and there is no doubt that the officers of this Bureau will be happy to do all in their power, not only to facilitate such interchange, but to collect and disseminate information on the question of training for industry and commerce, in which all countries are so vitally interested.

A. ABBOTT

September 1933.

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INTRODUCTORY

IT is not possible to have a clear understanding of the present system of technical education in England, or to discuss with profit its probable development in the future, without some consideration of the successive stages through which it has passed. Accordingly, although this book does not profess to be a history of technical and commercial education in England, it is proposed to describe some of the characteristic features of each of these stages, beginning with the Industrial Revolution. The survey of the developments of the nineteenth century will be brief. All that it will attempt to do is to describe the main tendencies in sufficient detail to indicate the sort of foundation on which it was necessary to build when we entered upon the new educational phase which began with the creation of Local Education Authorities in 1902.

Most of the book will be occupied with the later phases of the growth of education for industry and commerce; it is these which have for us of this generation a living interest.

It may be said at once that although there are certain features of English technical education which have persisted throughout its history, this does not proceed from its having been planned by far-sighted men, who had before them a clear vision of the distant future. On the contrary, the men responsible for the organization of technical education in this country seem usually to

have made such provision as they could for existing and plainly visible needs, and to have relied on their successors to modify this provision suitably and adequately, as fresh needs arose and were generally realized. This does not imply that there has been any lack of energy or enthusiasm on the part of the pioneers of technical education; there has been plenty of both. It does imply that the early workers in the field of technical education were usually unable to enlist the active support which proceeds from a strong popular feeling that a certain course of action is desirable. The advocates of technical education in this country have always been a comparatively small body of interested persons, and public opinion in favour of the establishment of a comprehensive and effective system of training for the recruits to industry and commerce has never been strong. There are, however, signs that an increasing number of business men have become willing to co-operate with schools and Education Authorities in framing schemes for the more complete training of the young men and women whom they employ. In the past, many of the leaders of British trade and industry have made their way without any such technical training as is given by schools; moreover, the industries with which they are connected have prospered without taking any active interest in technical schools and their students. In these circumstances, it is not surprising that for generations technical education has not been considered very seriously by a great part of the business community. Conditions have, however, changed, and it is becoming more and more clear to manufacturers and merchants that the methods of training their personnel must be overhauled and modified if these conditions are to be met successfully.

TECHNICAL EDUCATION A MODERN NEED

Technical education, in the modern sense of the term, did not exist until after the end of the eighteenth century. It was the Industrial Revolution which called it into existence. It is true that there has been technical training for skilled workers ever since industry began; every civilized country has employed definite and recognized means for handing down from one generation to another the methods—devised slowly and with difficulty—of making the goods needed for human needs and human enjoyment; but this training and this means of handing down traditional methods do not constitute what we now term 'technical education'. Until the Industrial Revolution, most skilled occupations were handicrafts, demanding for their proper exercise long practice and systematic instruction.

THE SYSTEM OF APPRENTICESHIP

Both the opportunities for practice and the means of instruction were provided by the system of apprenticeship. The master undertook to teach 'the art, craft, and mystery' of his trade; the apprentice bound himself by indenture to be diligent, to observe the instruction of his master, and to serve him faithfully for a term of years, his wages being fixed at such a rate as to give his master some compensation, through his services, for the training and the opportunities of learning he enjoyed.

This system worked excellently until the making of goods by hand—real manufacture—began to be replaced by the making of goods by machinery. When that time came, many workers became adjusters and

supervisors of machines rather than handicraftsmen. This is not the same thing as saying that they became unskilled workers; that they did not, any one who has seen an operative spinner at work, or has tried to turn wood in an old-fashioned lathe, will agree. The skill was, however, of a different kind. It was mental and bodily alertness, an ability to adjust hand movements to varying phases in the working of the machines, and skill in the adjustment of the machines themselves to differences in the qualities of the raw materials that was now needed.

The first result of the invention of the steam-engine was the collection by entrepreneurs of groups of workers into factories, and the organization of industry into larger units. Simultaneously, ingenious men turned their attention to devising machines, to be driven by steam power, which would perform more expeditiously and more accurately the same tasks as were formerly executed either by hand tools or by very simple machines. Thus, the power-loom and the spinning-mule were invented to replace the hand-loom and the spinning-wheel; the invention of the planing-machine, a simple form of milling-machine, the steam-hammer, the pile-driver, and other power-driven machines quickly followed.

There was accordingly a tendency in some industries for skill to be transferred from the craftsman himself to the engineer who devised and made the machine; the craftsman began to be replaced by the operative, and the metal worker became an engineer, inventing and constructing complicated instruments of production.

In some instances, acquired skill became valueless; in others, it had to be extended and increased. There

arose, in fact, a differentiation of workmen into two types, not sharply separated from one another, but still two types; and with the growth of the factory system, the proportion of machine-minders increased, rapidly at first, but afterwards more slowly. The system of apprenticeship, which had been quite suitable for the old conditions and the old type of workers, was not suitable for the new conditions and the new class of factory workers, and fresh means of training them became necessary.

As was inevitable before the invention of the steam-engine, when the only power available was either manual or that afforded by wind and running water, most of the old employers carried on their manufacturing operations on a small scale; each employer was therefore able to give individual attention to his apprentices, and to ensure that those of them who had been diligent possessed sufficient skill, on the completion of their term of service, to justify them in claiming the full status and pay of journeymen, that is, qualified workers.

Although apprenticeship was usually to a craft, this was not so universally, since boys learned the business of retail distribution under the same conditions as did apprentices to a craft. Robert Owen, for example, learned the drapery business in Stamford, serving his master, Mr. James M'Guffog, 'the first year for nothing, the second for a salary of eight pounds, and the third for an advance to ten pounds'.[1]

[1] Lloyd Jones, *Life of Robert Owen*, p 9.

EFFECTS ON APPRENTICESHIP OF THE INTRODUCTION OF MACHINERY

The introduction of machinery driven by power into industrial production had two immediate consequences of great importance from our present point of view. In the first place, the employer in the new factory industries had no longer only one or two lads gaining experience and skill in an occupation under his immediate care, but a much larger number. It was thus not possible for him, even if he had wished to do so, and if this form of training had still been appropriate, to give them that individual attention which had formerly been customary; the workshop had been replaced by the factory.

In the second place, the skill needed by the new type of workman was, as we have seen, not of the same kind. The Industrial Revolution had begun, a Revolution which 'separated England from her past as completely as the political Revolution separated France from her past'.[1] The changes brought about by this were immense. We are concerned here with only those consequences which relate to the training of the personnel of industry and commerce, but even in this limited field they were great and far-reaching. It is from this event that we can date the decline of the system of apprenticeship in England and the beginning of her system of technical education.

ANOTHER IMPORTANT FACTOR AFFECTING TRAINING

Before describing the first attempts at the creation in this country of a system of technical education,

[1] J L and Barbara Hammond, *The Town Labourer*, p 3

which should be an efficient substitute for the previous method of training skilled workers, it is necessary to refer to another important development in industrial practice. We have seen that the eighteenth century witnessed the introduction of mechanical inventions; but it saw also the development of chemistry, and the laying of the foundations of the industries dependent upon this branch of science. The use of coal-gas for lighting started in England in 1802, and the manufacture of sodium carbonate by the Leblanc process in 1814, while the manufacture of sulphuric acid on the large scale, the use of chlorine for bleaching, and that of the hot blast for iron smelting all began during the period we are now considering. For the first time, industry was to some extent dependent on the application to its practice of knowledge gained outside the workshop, that is, in the laboratories of scientific men, who usually had in view the satisfaction of their own curiosity and the increase of human knowledge, rather than any addition to industrial efficiency.

SUMMARY

To sum up, industrial recruits at the opening of the nineteenth century had begun very frequently to work together in groups collected in factories, rather than as individuals isolated in small workshops. The character of the skill needed by the qualified workman was changing from manual dexterity to the ability to adjust and control the operations of a machine driven by power. There was arising rapidly a body of knowledge which formed the very basis of some of the new industrial processes, although it could neither be gained in the workshop nor conveniently imparted there.

It is obvious that the conditions now existed for starting a scheme of training, differing in both method and content from that of apprenticeship It involved the gathering together in schools of groups of young workers of homogeneous needs, and teaching them the newly discovered principles underlying workshop practice. It was the realization of this fact that gave the start to technical education in England.

CHAPTER II.

THE MECHANICS' INSTITUTES

IT had become clear to many persons soon after the beginning of the nineteenth century that the changing character of industry demanded a reconsideration of the means of training many classes of skilled artisans. The first active step taken to provide a fresh method of giving this training appear to have been the institution of a series of lectures at the Andersonian Institution of Glasgow by Dr. Birkbeck, Professor of Natural Philosophy there; the first lectures were on the subject of mechanics. Later on, when Dr. Birkbeck removed to London, he continued to urge the provision of instruction in the scientific principles on which workshop practice should be based, and was finally successful in securing the foundation of the London Mechanics' Institute in 1823. He was encouraged by Lord Brougham, who interested himself greatly in the matter and contributed an article on 'The Scientific Education of the People' to the *Edinburgh Review* in October 1824. By this article and by his speeches, Lord Brougham did much to stimulate the establishment of Mechanics' Institutes in the provinces. In 1824 Mechanics' Institutes were set up in Aberdeen, Dundee, Leeds, Newcastle, Alnwick, and Lancaster, and in 1825 in Manchester, Birmingham, Norwich, Devonport, Plymouth, Ashton, Bolton, and other places.

The aims of the promoters of the Institutes are well summarized in Lord Brougham's article in the *Edinburgh Review*. He said:

'It is not necessary that all who are taught, or even a large proportion, should go beyond the rudiments: but

whoever feels within himself a desire and an aptitude to proceed farther, will press forward and the chances of discovery, both in the arts and in science itself, will be thus indefinitely multiplied. Indeed, those discoveries immediately connected with experiment and observation are most likely to be made by men whose lives, being spent in the midst of mechanical operations, are at the same time instructed in the general principles upon which these depend.'

ORIGINAL AIMS OF THE MECHANICS' INSTITUTES

The aims of the Mechanics' Institutes were thus twofold. For many persons they were to be schools for giving elementary instruction in reading, writing, and arithmetic; but for others they were to be places where workmen would receive instruction 'in those rules and principles which lie at the basis of the arts they practise'. Dr. Birkbeck, too, may be quoted. He said

'I have become convinced that much pleasure would be communicated to the mechanic in the exercise of his art . . . by a few systematic ideas upon which at his leisure he might meditate. It must be acknowledged, too, that greater satisfaction in the execution of machinery must be experienced when the uses to which it may be applied and the principles upon which it operates are well understood than where the manual part alone is known, the artist remaining entirely ignorant of everything besides.'[1]

It was quite in accordance with these views that his first series of lectures should have dealt with 'the mechanical affections of solid and fluid bodies'. Exactly the same attitude towards the new movement was that of R. Detrosier in a lecture on 'The Benefits of

[1] Hole, *Mechanics' Institutes*, 1853, p 15.

General Knowledge' which he gave to the Banksian Society in 1829.

Some of the most enthusiastic advocates of Mechanics' Institutes therefore had not in mind mainly the direct advantage to industry of a widespread knowledge of the scientific principles underlying the processes of industry, although they certainly did not overlook this possibility; but they were far more concerned with 'the cultivation of our capacities and the attainment of knowledge'.

The actual founders of some of the Mechanics' Institutes had, however, a somewhat different aim. Thus, the intention of the promoters of the establishment of the Edinburgh School of Arts in 1821 was

'to afford to workmen instruction in the various branches of science which are of practical application in their several trades, so that they may better comprehend the reason for each individual operation that passes through their hands and have more certain rules to follow than the mere imitation of what they have seen done by another. It is not intended to teach the trade of the carpenter, the mason, the dyer, or any other particular business; but there is no trade which does not depend more or less on scientific principles, and to teach what these are and to point out their practical application will form the business of this establishment'[1]

The prospectus of the Manchester Mechanics' Institute, the first to have a building specially adapted for its purpose, quotes almost verbatim the prospectus of the Edinburgh School of Arts, but is more explicit in the statement of its utilitarian aims, since it proposes to train mechanics and artisans in such a way that 'they may possess a more thorough knowledge of their

[1] Dobbs, *Education and Social Movements*, p 173

business, acquire a greater degree of skill in the practice of it, and be qualified to make improvements and even new inventions in the arts which they respectively profess'. It is of interest to note that there is even a suggestion that scientific research will be undertaken in the Institute, since the prospectus goes on to say: 'There is no art which does not depend more or less on scientific principles, *and to search out what these are*, and to point out their practical application, will form the chief objects of this Institution.' [1]

The Mechanics' Institutes started with high hopes, and for some time they were carried on successfully. In 1850 there were 610 Institutes in England and 12 in Wales, with a total membership of over 600,000.[2]

'The movement had genuine educational merits. It started from living interests. There has always been a strong strain of scientific curiosity amongst the English working classes, particularly in the North of England . . . The Mechanics' Institutes aimed at satisfying the desire of workmen in an age of scientific triumphs to understand the secret of the new power which was revolutionizing industry. They filled a gap for which there was no other provision' [3]

In spite of the enthusiasm of their founders, the Mechanics' Institutes did not fulfil the functions for which they had been created; but they made a serious contribution to the establishment of the modern system of technical education. There is no doubt that they helped to direct public attention to the increasing demand for popular education; they stimulated too the desire for reading and did something towards the

[1] Dobbs, *Education and Social Movements*, p 173
[2] Quoted in *Quarterly Review*, January 1863
[3] Report on Adult Education.

satisfaction of this desire. They did not, however, spread scientific and artistic knowledge as widely as had been confidently expected by their founders. Thus, the Report of a Committee appointed by the Society of Arts in 1858 stated: 'Mechanics' Institutes are no longer Institutions for mechanics; some enrol a small number of artisans, while others register none at all . . . though they are still called Mechanics' Institutes, they are places of resort for the tradesman, shopman, and the middle class generally of the neighbourhood.' This Report went on to say: 'It seems to have been taken for granted that because there are striking instances of the sons of toil reaching high intellectual eminence, the whole mass could and would do likewise if a fair field were afforded them and the key of knowledge put within their power. . . . The truth is that the whole scheme was pitched too high to be of general use.'

REASONS FOR THE FAILURE OF THE MECHANICS' INSTITUTES

There appear to have been several reasons for the failure of the Mechanics' Institutes to fulfil completely their expressed aim. The first was that the elementary education of the artisans for whom the instruction in science and art was intended was very defective. There is abundant evidence to show the backward state of this grade of education at this time. A Select Committee stated in 1838:

'Your Committee now turn to the state of education in the large manufacturing and seaport towns, where the population has rapidly increased during the present century; they refer for particulars to the evidence taken before them, which appears to bear out the following results:

'1st That the kind of education given to the children of all working classes is lamentably deficient.

'2nd That it extends (bad as it is) to but a small proportion of those who ought to receive it'[1]

Mr. and Mrs. Hammond say: 'In 1818, one in four of the children of the poor were receiving education of some kind', and add that 'in 1839, 1840, and 1841, 40 per cent. of the men and 65 per cent. of the women married or witnessing marriages in Lancashire and Cheshire could not sign their names'.[2]

It is not surprising therefore that the instruction in the principles of science provided by the Institutes did not make a wide appeal. The absence of previous education must in itself have been an almost insuperable barrier to any systematic study of science. It was nearly impossible for an artisan, whose days were occupied in a laborious task and whose mind had never undergone the discipline of continuous attention to study, to make great progress, or indeed to find much interest, in the careful consideration of the principles on which the practice of his occupation was based.

A second reason was the fact that the proportion of artisans to whom a knowledge of science or art could be of any direct use was small, even in those industries such as bleaching, which had already in the early nineteenth century begun to apply to their everyday practice the newly acquired knowledge of chemistry.[3]

A third factor, which must have been of great importance, was the limited amount of organized

[1] Quoted by A. H Robson, *The Education of the Children engaged in Industry*, p 14.

[2] J L and Barbara Hammond, *The Town Labourer*, pp. 54, 55

[3] Higgins *History of Bleaching*, p. 127.

knowledge relating to the principles underlying workshop practice. It is true that the study of mathematics and of pure mechanics had proceeded far. It is also true that chemistry had made rapid strides since the days of Priestley, Cavendish, Scheele, and Lavoisier, but during the first half, at any rate, of the nineteenth century it had not reached the stage of general application to industrial problems, in spite of the frequency with which the importance of teaching fundamental truths relating to industrial practice was emphasized. There is no doubt that the lack of industrial scientific research during this period hindered the speedy accomplishment of the aims of the pioneers of technical education. It is equally certain that it has affected the nature and amount of the provision of technical education throughout its history in this country. To take an example, both the Edinburgh School of Arts and the Manchester Mechanics' Institute mentioned in their prospectuses their intention to train the dyer in the scientific principles underlying his craft; but in 1825 the use of natural dyes of unknown chemical constitution was universal, and it was not until many years later that madder, fustic, logwood, natural indigo, and other dyes of vegetable origin could be replaced by artificial dyes whose chemical composition and exact behaviour were accurately known. For this reason, any technical instruction for dyers must, when it was first introduced, have been to a great extent empirical. It seems certain that what is true of education for dyers is true of technical instruction for persons engaged in other industries whose scientific basis has not yet been fully established. In other words, it is not possible to give students a thorough knowledge of the principles of industrial practice until

the progress of research in pure science and of the investigation of industrial problems has resulted in the creation of a body of organized knowledge and a thorough understanding of the relation between theory and practice. This is a matter which it is proposed to deal with more fully in a later chapter.

It is probable that the early promoters of technical education soon realized the difficulty of reconciling theory and practice, but it is also likely that, having witnessed in their own lifetime the swift developments of industrial practice and the great achievements of the early engineers, physicists, and chemists, they underestimated the time needed for a comprehensive study of the technical problems before them.

What has been said of the comparatively backward state of our knowledge of the methods of applying science to industry was not true of the application of art to industrial practice. For many centuries, and in many countries, art had been applied to every possible branch of construction—building, metal-work, textiles, woodwork, leather-work, and so on There was not therefore the same reason for delay in the linking up of the school with industry in the case of the artistic crafts; but it must be taken into account that the mechanical production of objects of utility on the large scale has not usually tended to beauty of design, since the individuality of the craftsman can no longer be impressed on the goods produced. Further, one competent artist can under a factory system make designs for the whole of the goods produced by a multitude of operatives. It was thus unlikely that the Mechanics' Institutes would attract large numbers of men desirous of acquiring skill in the application of art to large-scale production in factories.

THE METHOD OF SHARING THE TASK OF TRAINING

Although, as we have seen, there was some divergence between the aims of such men as Dr Birkbeck and some of the other promoters of Mechanics' Institutes, the former looking for the enlightenment of the artisan and the widening of his intellectual interests, and the latter seeking mainly the advancement of industry through its having the services of educated workers, there was complete agreement amongst them as to the need for the education of the artisan in science. They agreed also as to the undesirability of teaching in schools the actual practice of manual or mechanical operations. It appears to have been generally felt that as an in- industry became more scientific in its practice, the burden of training the workman could no longer be entrusted to the employer alone, but must be shared between the employer and the school. It was thought that while it was the task of the employer to train his recruits in workshop methods, it was the duty of the school to give him a knowledge of underlying scientific principles.

To us, looking at the matter from the distance of a hundred years, it seems as if the movement for the setting up of Mechanics' Institutes must necessarily have resulted in the employer being relieved from part of his responsibilities towards the young people in his works. He had formerly been in the habit of binding himself by legal agreement to give a full and complete training to his apprentices. Now he was usually freed from this legal obligation, and had to provide only workshop training, the other part of the training was provided by voluntary agencies out of funds raised by the workmen themselves and by

philanthropic persons interested in their welfare. It is possible, however, that the founders of the Institutes and the other persons concerned looked upon the matter differently; they may have regarded instruction in science as being something to be added to the ordinary training of a skilled worker and not part of it.

However the matter was regarded at the time, it is of great importance to note that the conception of the relative functions to be performed by the workshop and the school has never been abandoned throughout the history of technical education in England. That the school should teach the theory relating to an industry and the works its practice has been almost as generally accepted as if it were a law of nature. In this connexion, it is of interest to compare the definition of the term 'technical instruction' in the Technical Instruction Act of 1889 with the quotation given above from the prospectus of the Manchester Mechanics' Institute. The definition is as follows:

'The expression "Technical Instruction" shall mean instruction in the principles of science and art applicable to industries and in the application of special branches of science and art to specific industries and employments. It shall not include the practice of any trade or industry or employment, but, save as aforesaid, shall include instruction in the branches of science and art with respect to which grants are for the time being made by the Department of Science and Art . . '

It is obvious from this definition that the view adopted at the beginning of the century as to the respective functions of the school and the workshop in the training of industrial recruits had not changed during the sixty-four years from 1825 to 1889; and there are few signs that it has yet changed greatly. It represents an atti-

tude towards the technical education of recruits to industry which is entirely different from that existing on the continent of Europe. Thus, Monsieur Labbé, Director-General of Technical Education in France, writing on the trade schools of France, says:

'Any one who enters our *écoles pratiques* realizes that the workshop is a very essential element, not only on account of its material importance, the space it occupies, and the extent of its equipment, but still more on account of its place in the time-table. The number of hours to be devoted to workshop instruction in the schools is calculated on the basis of industrial practice; and if it is somewhat less than that in the works, this is because workshop apprenticeship is slower than school apprenticeship, since everything is done with the single aim of giving effective training to the pupil. The same relative value is always attached to workshop practice in the school as in the works itself'[1]

This conception of the function of the school is not peculiar to France, but is that of Belgium, Holland, and Czechoslovakia, at least. It applies to the schools of various grades, although the proportion of time devoted to workshop practice in the schools is less for the students aiming at occupying very high positions in industry.

On account of the great importance of arriving at a sound view as to the function of a technical school in such a country as this, it is proposed to discuss more fully the comparative advantages and disadvantages of the methods of training which are traditional in this country and on the Continent respectively. This discussion is postponed to a later chapter since it is not possible to enter upon it with profit until the English system has been reviewed.

[1] Labbé, *La Taxe d'Apprentissage*, p. 21.

CHAPTER III

DEVELOPMENTS DURING THE SECOND HALF OF THE NINETEENTH CENTURY

IT will have been noted that the Mechanics' Institutes were established and maintained by voluntary effort. This was only what might have been expected. In the past the State had left the training of industrial recruits to industry itself, through the system of apprenticeship, and had given no financial assistance to it. It was inevitable then that, before Parliament would be willing to make grants to institutions which aimed at giving part of this training, a new outlook on education and a fresh definition of the precise function of the school was necessary. Even in the field of elementary education the State was not very active during the early part of the nineteenth century, its grants being made to only such bodies as the British and Foreign Schools Society, founded in 1808, and the National Society for Promoting the Education of the Poor in the Principles of the Church of England, founded in 1811. Both these organizations established and maintained schools in all parts of the country, and the grants to them from Parliamentary funds were in aid of the building of schools in localities where private subscriptions were forthcoming. This being the attitude of the State towards elementary education, it was unlikely that it would readily undertake to assist technical instruction, which had always been regarded as a function of the employer. As regards the employer, it was on him, as we have seen, that the whole of the responsibility of training had formerly rested; now, he saw some of this responsibility transferred to Mechanics' Institutes,

founded and carried on by philanthropic persons, and was quite content to see this. One employer, giving evidence before a Select Committee, said: 'Schooling belongs either to the parents, or it belongs to the State; it does not belong to the employer in my opinion; it is either a parental or a national duty.' [1]

ACTION BY THE STATE

It was not until the middle of the nineteenth century that the State, 'slowly wise and meanly just', began to make any definite provision of technical education. Although this was done at first on a small scale, the movement was of great importance, since it indicated a recognition of the fact that the training of industrial recruits was no longer a burden to be borne by industry alone, or by industry aided by philanthropy, but one to be shared between industry and the community, each of these bearing that part of the burden which was most convenient. The opinion that the complete training of many workers consists of two parts—practical experience in the workshop and theoretical instruction in a Mechanics' Institute—was already generally held. It was therefore almost certain that when the State did begin to assist technical training, it would confine its aid to the theoretical side.

The first step taken was the establishment in 1837 by the Board of Trade of a Normal School of Design in London. In 1841 the Government decided that the same Department should aid in the establishment and maintenance of provincial Schools of Design, by making to them annual grants for the training and payment of

[1] Quoted by Robson, *The Education of the Children engaged in Industry*, p 64

teachers, the purchase of apparatus, and the preparation of models. There were, by the year 1852, seventeen such schools in existence, most of them being in important industrial centres, such as Manchester, Birmingham, Glasgow, Leeds, and Paisley. In 1852 a 'Department of Practical Art' was established, still under the Board of Trade.

After the Great Exhibition of 1851 it was decided to grant State assistance to the teaching of science, the method adopted being that already employed for the encouragement of art teaching. The Department accordingly became the 'Department of Science and Art', which remained under the Board of Trade until 1856, when the Education Department was constituted to include (*a*) The Education Establishment of the Privy Council Office, and (*b*) The Department of Science and Art.

THE RISE OF THE EXAMINATION SYSTEM

It was about this time that the system of examinations, which has exercised, and still exercises, a great influence on technical education, received a considerable impetus. For many years the Edinburgh School of Arts had granted to each student who had, after three years' attendance at the School, satisfied the examiners, an 'attestation of proficiency' and life membership of the school on condition that he paid an annual fee of two shillings. Mr. Hudson says of this attestation that 'it certifies at once the correctness of his conduct, the extent of his studies, and the proficiency he has made; and go where he will, and apply for what situation he may, this certificate of membership obtained so honourably must ever be his best recommendation, as well as the most powerful stimulus

to a line of conduct which should support the character he has acquired'.[1]

In England, a Committee appointed by the Society of Arts, the body which had originally proposed the holding of the Great Exhibition, reported in 1853 in favour of the institution of a national system of examinations for provincial schools with a central organization which would grant certificates of proficiency. The Society of Arts itself held examinations in London in 1856, the subjects being English, foreign languages, geometry, mechanics, chemistry, animal physiology, botany, agriculture, physical geography, and freehand drawing. In 1857 it extended these examinations to provincial centres, conducting them through local committees set up for the purpose. A system of local examinations was established by the College of Preceptors in 1853, and the University Local examinations were instituted in 1858. The movement for promoting education by offering certificates to diligent students who had shown their ability to profit by instruction was thus well under way in England soon after the middle of the nineteenth century.

Although the principle of granting aid to instruction in science had been adopted in 1853, and certain examinations had been held by the Department of Science and Art in 1857, it was not until 1859 that this Department instituted a general system of examinations in science applicable to the whole country. At first there were two types of examinations: (*a*) for teachers, who received 'certificates of competency', and (*b*) for students. The examinations were in those branches of science related to industrial occupations, and were part of the

[1] Quoted by Hole, *Mechanics' Institutes*, p 63

provision for encouraging the study of science amongst the industrial population. They were carried on in the same way as those of the Society of Arts, the main differences being that they aimed quite definitely at producing a supply of competent teachers, and that they provided financial assistance to schools by making payments on the successes of individual students. The special examinations for teachers were discontinued in 1867.

At first the subjects of examination were practical plane and solid geometry, mechanics and machine drawing, building construction, elementary physics, chemistry, geology and mineralogy applied to mining, and natural history. After a short time, the natural history group was, at the suggestion of Professor Huxley, divided into zoology and botany; and a few years later, the subjects of mathematics, navigation, nautical astronomy, physical geography, and steam were added.

AID GIVEN TO THE EDUCATION OF ONLY THE INDUSTRIAL CLASSES

A feature of this examination system, which is of interest and importance, is that it was intended for 'the industrial and operative classes'; the schools to which it applied were thus in the direct line from the Mechanics' Institutes. Only the successes of persons coming within the definition of 'Industrial students' were eligible for grants from the Department until 1897, when this restriction was abolished, since it appeared 'that the number of students excluded by existing rules from earning payments is a very small proportion of those examined'. The Department still retained, however, a regulation that 'schools in receipt of grants must be approved by the Department as

suitable in character and financial position to receive aid from public funds'.

The *Science and Art Directory* for 1870 gave a careful description of the categories of persons to be regarded as industrial students This included:

(*a*) Artisans or operatives in receipt of weekly wages.

(*b*) Coast-guards, policemen, and others, who, though in receipt of weekly wages, do not support themselves by manual labour.

(*c*) Teachers in elementary schools in connexion with the Education Department.

(*d*) Persons in receipt of salaries not large enough to render them liable to income tax, as some descriptions of clerks, shopmen, &c.

(*e*) Small shopkeepers employing no one but members of their own family, and not assessed to income tax.

(*f*) Tradesmen and manufacturers on their own account, supporting themselves by their own manual labour, not employing apprentices, journeymen, &c., and not assessed to income tax.

(*g*) The children (not earning their own livelihood) of all such persons above mentioned.

This limitation of the financial contribution of the State to instruction in the scientific principles underlying the conduct of industry is dealt with here in some detail because of its significance By confining its grants in this way, the State acted on the assumption that it was workmen who had received an elementary education, and they alone, who needed aid in their efforts to gain a thorough understanding of science and the application of science to manufacture. This would

have been a reasonable hypothesis at the opening of the century, when industry was only beginning to be centralized in factories, for at that time there were no great entrepreneurs, and the works manager, planning and supervising skilful production on a large scale, had not yet come into existence; but, as we see from the regulations of the Science and Art Department, it was held until very near the end of the century. It was unreasonable even in 1860, since it assumed that in a modern State, depending for its prosperity on the successful conduct of its industries, there was no need for any public provision whatever to be made for the benefit of those recruits to industry who happened to start out in life above the level at which income tax becomes payable. In fact, the neglect of the State to make any provision of technical education for students of good general education was entirely in accordance with its failure throughout the whole of the nineteenth century to make any real provision of secondary education

The system of encouraging the teaching of science by means of payment on examinations managed by the State soon became flourishing, as is shown by the following Table:

Year	*No of Schools submitting candidates*	*No of Candidates*	*No. of Classes*
1862	70	2,543	140
1872	948	36,783	2,803
1882	1,403	68,581	4,881

It was not until 1895 that it was decided to substitute for the method of paying grants on the results of examinations a method of paying them partly on the attendances of students and partly on examination

successes. In 1911 the elementary examinations, and in 1915 the advanced examinations, were finally discontinued.

CRITICISMS OF THE SCIENCE AND ART DEPARTMENT

The examinations of the Science and Art Department undoubtedly served a useful purpose so far as they went. At the same time, they met with a good deal of criticism. As early as 1869 Professor Fleeming Jenkin dissented from a statement in the Report of the Department for 1866, in which it was stated that 'the various modifications and enlargements made from time to time in the system of aid to science instruction have now rendered it a system which may fairly be said to meet the requirements of the country, so far as elementary science in concerned'. Jenkin, commenting on this somewhat complacent statement, said: 'From that assertion I most thoroughly dissent, but I am not prepared to join the ranks of those who think that no good thing can come out of South Kensington.' He went on to urge that far more attention should be paid to mechanical drawing, and made a striking comparison of the curriculum of a Scottish school with that of a Prussian industrial school; he described also the arrangements existing in Paris for teaching trades to boys through giving them workshop instruction in a special trade school carried on by the Christian Brothers. He expressed the opinion that such subjects as mathematics, mechanics, chemistry, and physics could not 'be successfully prosecuted without a great reform in all our middle-class schools effected by parliamentary legislation of a difficult nature. The elementary schools,' he went on to say, 'inspected and aided by the Council of Education,

can do nothing to forward these studies, except by improving the foundation on which they ought to be built.' It is obvious that Professor Fleeming Jenkin saw quite clearly that the full development of technical education must wait until there was an effective system of secondary education; but this system was not initiated until 1902, thirty-three years after the date at which he wrote.

THE CITY AND GUILDS OF LONDON INSTITUTE

Another criticism of the examinations of the Science and Art Department was the narrowness of their scope, since they made no provision for encouraging instruction in the technology of a number of important industries, e.g. textiles and the crafts of building. It was not until 1873 that examinations were instituted in 'technological subjects' by the Royal Society of Arts, who transferred them in 1879 to the City and Guilds of London Institute, a newly formed body composed of representatives of the Corporation and certain of the Livery Companies of London who contributed to its funds. The Institute was established 'for the purpose of all such branches of Science and the Fine Arts as benefit or are of use to, or may benefit or be of use to, productive and technical industries especially and to commerce and industries generally or any branches thereof and for the utilization of such means as will promote the several exclusive purposes aforesaid'.

The City and Guilds of London Institute organized its work on precisely the same lines as did the Science and Art Department, holding examinations and issuing certificates to successful candidates. Moreover, from the funds placed at its disposal by the City Companies, the Institute was able to pay grants on the results of

examinations in the same way as the Department. It continued to pay these grants until the passing of the Technical Instruction Act in 1889, and of the Local Taxation (Customs and Excise) Act in 1890, enabled the County Councils set up in 1888 to raise funds for technical education from other sources. At the time of its establishment, the City and Guilds of London Institute filled an obvious gap in the national system of education; and during its existence it has done a most important work, especially in preserving the old tradition that special means are needed for the training of craftsmen. No account, however short, of its inception, or of the task it has accomplished, can omit reference to the valuable part played by Sir Philip Magnus, the first Superintendent of its Department of Technology, in its creation and working.

Professor Fleeming Jenkin was not alone in his criticisms of the lack of proper facilities for learning science and its industrial applications. There was for many years a good deal of uneasiness on account of the backward state of technical education. At the Great Exhibition of 1851 there were 100 different departments in which goods were displayed, and in nearly all of these Great Britain was awarded the palm of excellence. In 1867 there were at the Paris Exhibition 90 departments, and Great Britain excelled her competitors in only 10 of them. This change in the relative excellence of the goods exhibited was attributed by her continental competitors to their better systems of general and technical education.[1] One result of this was an instruction to the Schools Inquiry Commission of 1867 to inquire as to 'the inferior rate of progress

[1] G F Armstong, Lecture on Higher Technical Instruction, 1885

recently made in manufacturing and mechanical industry in England compared with that in other European countries'. This Commission circulated to a number of business men a letter written by Dr. Lyon Playfair to Lord Taunton and asked for their observations on it

In this letter Dr. Playfair stated that he had noticed as a juror in one of the classes of the Paris Exhibition the inferiority of the British exhibits, and that his own impression had been confirmed by manufacturers with whom he had discussed it. He said: 'The one cause of this inferiority upon which there was most unanimity is that France, Prussia, Austria, Belgium, and Switzerland possess good systems of industrial education for the masters and managers of factories and workshops, and that England possesses none.' The replies to the circular of the Schools Inquiry Commission were quite consistent with what Dr. Playfair had observed. Practically all the business men consulted spoke of the superiority of the foreign educational systems, and some of them referred to the better training of the responsible officers of industry. One of them, for example, said that the excellence of the foreign goods was due 'not to the workmen, but in great part to the superior training and attention to the general knowledge of their subject, observable among the managers and sub-officers of industry. No candid person can deny that they are far better educated, as a rule, than those who hold similar posts in Britain.'

THE ROYAL COMMISSION ON TECHNICAL EDUCATION

It might have been expected that these opinions, expressed by responsible persons, who had taken the trouble to make themselves acquainted with the facts,

would have had some immediate effects; but the national complacency remained undisturbed. It was not until 1881—that is, fourteen years later—that the Government set up a Royal Commission on Technical Education under the chairmanship of Mr. (afterwards Sir) Bernhard Samuelson. The Commissioners visited France, Switzerland, Germany, Austria, Belgium, Holland, and Italy. It may be mentioned incidentally that they paid their own travelling expenses.[1] In addition to inquiring into foreign systems of technical education, they received a great mass of evidence from English business men and officials. The value of their Reports—issued in 1882 and 1884—probably consists rather in the evidence relating to home and foreign conditions than in their actual recommendations. They found that the provision of an effective system of elementary education throughout the country a dozen years before was increasing the demand for further education, and this not merely in the subjects in which the two central examining bodies held examinations, but in literary and commercial subjects also. The adverse criticisms made by Fleeming Jenkin and others many years before were confirmed, as it was stated explicitly by a number of witnesses that the teaching of science and art in the schools had little relation to the actual practice of the various industries. The comments

[1] J. W Adamson, *English Education 1789–1902*, p 403, says 'Each Commissioner, so Roscoe says, had to pay his own expenses, the Government being responsible only for secretarial expenditure and cost of printing' (Cp Dickens, *Posthumous Papers of the Pickwick Club* 'That this Association cordially recognizes the principle of every member of the Corresponding Society paying his own travelling expenses, and that it sees no objection whatever to the members of the said Society pursuing their inquiries for any length of time they please, upon the same terms')

on the work of the Science and Art Department were not, however, all unfavourable. Professor Huxley, for example, pointed out with obvious truth that whereas there had not existed, until the Department began its examination schemes, any machinery whatever for disseminating scientific knowledge, except that constituted by the Mechanics' Institutes, there was, by the year 1882, no town of any importance in the country which did not possess such machinery; further, as he indicated, the system of National Science Scholarships provided means for bringing young men of proved capacity to the Normal School of Science in London to obtain a thorough scientific training.

The Commissioners were somewhat critical of the work of the City and Guilds of London Institute also While recognizing that the quality of the teaching of technology in local classes would ultimately be improved through the efforts of the Normal School of Science and the City and Guilds Central Technical College, they considered that the payment of grants on examination successes led to teachers of both science and technology devoting themselves too much to establishing large elementary classes and neglecting to try to form advanced classes, which would necessarily be smaller and produce less aid from grants.

They urged the importance of fostering the teaching of manual work in wood and metal in the elementary schools; of giving a more practical character to the instruction in science subjects; of arranging organized groups of related subjects for students; of devoting more attention to the applicability of design to materials; and of encouraging work in science of a more advanced kind. It is of interest to note that they suggested, too, that it should be made a condition in

certain industries that young persons requiring instruction should receive it either in works schools, or in such schools as were available, the employers and trade organizations to contribute to the cost of this.

THE TECHNICAL INSTRUCTION ACTS

At last, in 1889, twenty-one years after the Paris Exhibition had shown, first, that in many classes of goods Great Britain was falling behind her competitors; and second, that this was due in some degree to her defective system of education, a Technical Instruction Act was passed, giving power to County Councils and to Urban Sanitary Authorities to levy a penny rate in support of technical instruction, the curricula to be approved by the Science and Art Department. In the following year, additional funds for technical instruction were made available by the Local Taxation (Customs and Excise) Act. Under this Act, certain surpluses with which it had been intended to compensate publicans for the loss of their licences were allotted to local authorities for expenditure either in aid of technical instruction or in relief of rates. These surpluses were known, from their origin, as 'whisky money'. The amount spent from them in 1892–3 was £472,500, but in 1901–2 it had reached £859,011 out of a total expenditure from public funds for the same object of £1,035,031.[1] The Act empowering authorities to spend whisky money on technical education was repealed by the Education Act of 1902, though the money was still ear-marked for the purposes of higher education by that Act.

[1] Montmorency, *The Progress of Education in England*, p 111.

THE PROVISION OF TECHNICAL SCHOOL BUILDINGS

The authorities responsible for technical education had now not merely pressure from persons who had been convinced, either by their own experience or by the findings of the Royal Commission on Technical Education, that action was urgently needed. They had also funds available from public sources for the purpose of developing a more effective system. The last ten years of the century saw therefore a great deal of activity, especially in the provision of new buildings and the extension of old ones. This was very natural, since the problem of securing suitable premises and equipment had hitherto been very difficult to solve. It is true that the Department of Science and Art had for many years given grants in aid of the building of schools. At first these were given in respect of schools of art only, but in 1868 it was decided to extend them to science schools also. The grants were not to exceed £500 in any single instance; this was, of course, an amount of considerable importance in a small town, but it was of little assistance towards the erection of a technical school suitable for the needs of a great industrial community The building grants were finally discontinued in 1898, in spite of the expressed opposition of some of the associations of authorities; at the time when they were discontinued, the total sum which had been disbursed from 1861 was £94,339.

During the last ten years of the century, twenty-five institutions, of which twelve were in county boroughs, had been transferred to the technical instruction authorities. The sums raised by loan for the erection of buildings were substantial, being in 1895–6, £179,501; in 1896–7, £142,413; in 1897–8, £69,333; and in

1898–9, £105,301. There was great progress in London, although the task of the London County Council had been eased by the foundation of the Polytechnics and similar institutions at an earlier date. In the provinces, Birmingham, Blackburn, Brighton, Halifax, Huddersfield, Hull, Leicester, Manchester, Norwich, Oldham, Rochdale, Salford, and West Ham were amongst the larger towns which were supplied with new or improved schools during this period of expansion, while a number of the smaller towns also obtained more adequate premises for their work.[1]

The handing over of powers to local authorities in respect of technical education had another result of great significance. Until 1890, the nature, scope, and standard of the instruction aided by public funds had been determined centrally; it was the Science and Art Department and the City and Guilds of London Institute that had controlled completely the organization and character of technical education aided from their resources. Public assistance was now available from both the local rates and the whisky money, even though the instruction was not prescribed by one of the central organizations. This diminution of external control had the effect that local interest was increased, since the local bodies had no longer the sole task of selecting those subjects which they thought suitable from a list presented to them. They could now make additions to them in accordance with their own views as to what was necessary for their individual needs. Naturally, some money was wasted in the provision of instruction of little value, but on the whole it appears to have been spent wisely, as is indicated, for example,

[1] Board of Education, *Educational Pamphlet*, No. 49, p 13.

by the amount devoted to the satisfaction of the primary need—that of buildings properly adapted for their uses.

THE EVENING CONTINUATION SCHOOLS

The last few years of the century were marked by another development. For many years there had been a system of evening schools carried on under the Elementary School Code, but almost all they did was to repeat the work of the elementary day schools, since there were certain limitations imposed on them as to the curriculum and the age of the pupils on whom grant was payable. In 1898 a separate Code was issued by the Education Department for 'Evening Continuation Schools'. This provided a wider range of subjects of instruction, the upper limits of age were removed, and grants on examination results were replaced by grants on attendance. The objects of these changes were twofold. In the first place, it was intended to afford opportunities to persons beyond the ordinary school-leaving age for the study of subjects not included in the curriculum of the elementary school, and not aided by grants from the Science and Art Department; the development of primary education after the passing of the Education Act of 1870 had given rise to an increasing demand for this kind of instruction. In the second place, it was contemplated that under the new Code the evening schools would do something to prepare young people for more advanced studies in classes either under the Science and Art Department, or carried on by County or County Borough Councils.

The subjects aided under the new Code included manual and technical instruction, languages, physical

exercises, domestic subjects, and commercial subjects; none of these, except certain subjects of science, had previously been eligible for grants from State sources.

The success of the evening continuation schools under the new plan was remarkable, when judged by numerical standards. The number of pupils in attendance increased from 298,724 in 1896 to 474,563 in 1899, and of those in attendance in the latter year, as many as 68,000, or 14·4 per cent of the total number, were over 21 years of age. Much of the instruction was, however, of a very elementary kind; thus, in 1899, 23 per cent. of the pupils were learning arithmetic; 15 per cent. writing and composition; 12 per cent. writing and reading; 7 per cent. reading and recitation; 9 per cent shorthand; 8 per cent. geography; and 7 per cent. vocal music. Further, since 12 per cent. of the total number of all the pupils were learning needlework, a high proportion of the girls and women must have been learning this subject.[1]

Another feature of the evening continuation schools at this time was the comparatively unorganized state of their curricula, since it was very usual for pupils to attend for subjects not grouped together to form a course.

THE CREATION OF THE BOARD OF EDUCATION

In 1899 the Board of Education Act combined into a single department the powers formerly exercised by the Education Department and the Department of Science and Art, and this step was followed in 1901 by the transfer of the responsibility for the central administration of the evening continuation schools to the

[1] *Educational Pamphlet*, No 49, p. 11.

South Kensington Branch of the Board, which was the direct predecessor of the present Technological Branch, although at that time—and indeed until after 1902—it had some responsibilities in connexion with secondary education, as well as with what came to be called 'further education'.

THE EDUCATION ACT OF 1902

In 1902 came the Education Act which called into existence the Local Education Authorities and gave them very wide powers. It authorized them to establish and maintain schools of all types below the university plane, as well as to aid schools which they themselves had not provided. The consequences of this Act have been of far-reaching importance to this country; and it is mainly with these, so far as education for industry and commerce is concerned, that it is proposed to deal in the succeeding chapters.

CHAPTER IV

THE POSITION AT THE BEGINNING OF THIS CENTURY

SINCE the year 1902 marked the beginning of a new epoch in the history of technical education in England, it is proposed to summarize briefly the position of this branch of education at the end of the nineteenth century.

1. It was a generally accepted opinion that the burden of training recruits to industry was one to be shared between industry and the community; the share to be borne by industry was the training in workshop practice during employment, while that to be borne by the community, acting through the schools it maintains, was the teaching of the theoretical principles which underlie workshop practice.

This view of the respective functions of industry and of the school had its origin early in the nineteenth century, when Mechanics' Institutes were first set up, was accepted by the framers of the Technical Instruction Acts, and was generally held in a rigid form, not only in 1902 but much later.

2. During the first half of the nineteenth century no assistance was given from State funds to the promoters of technical education. After the establishment of the Science and Art Department, this Department granted aid towards the education of the 'industrial classes' only. The successes in its examinations of students who paid income tax, or whose parents paid income tax, were not eligible for grant, although it had been stated frequently by competent observers that it was the general and technical education of the masters and

managers that was defective as compared with that of similar workers on the Continent.

3. After the Technical Instruction Acts were passed, there was no administrative restriction on the expenditure of funds not derived from the Department on the education of others than wage-earners.

4. Grants were made by the Science and Art Department in aid of instruction in a somewhat limited range of subjects. There were no grants from this Department in respect of the teaching of textiles, boot and shoe manufacture, plumbing, dyeing, and other subjects of great industrial importance.

5. Nearly all the instruction was given in the evenings of the winter months to persons 'whose ordinary employment or avocation occupied the greater part of their time'. This was the obvious corollary of the limitation of grants from the Department to the instruction of the wage-earning classes.

6. The vast majority of the students attending science and art schools had finished their full-time education at the age of 13 or 14. There was not, in fact, any widespread system of secondary education, and the proportion of the population who had received this type of education was small.

7 The evening continuation schools had been reorganized, but although they were numerically successful, they gave little instruction except in elementary and recreational subjects. They did very little to prepare ex-elementary school pupils for specialized work in science and art schools.

8. Many pupils attended the science and art schools for instruction in single subjects, or in several unrelated subjects, since the system of grouped courses had not yet been developed. Much of the work of these schools

was on a low plane on account of the defective early education of their pupils.

9. There had been very little consideration of commercial education, which was generally regarded as including mainly the office arts.

10. The great bulk of the work of the science and art schools was prescribed by the central examining bodies, that is, the Science and Art Department and the City and Guilds of London Institute, although there were the beginnings of freedom to take account of local circumstances and conditions after the Technical Instruction Acts had made available certain limited funds from other sources.

11. The Reports of the Royal Commission on Technical Education issued in 1882 and 1884 had shown that England was relatively backward both in her provision of technical education and in the esteem in which this branch of education was regarded; and they had compared our national provision unfavourably with that of other countries. At the end of the nineteenth century, in spite of the energy shown by the different local committees, our position as regards technical education was still relatively bad.

The Period from 1902 to 1933

CHAPTER V

THE EVENING CONTINUATION SCHOOLS

THE only public provision of secondary education made in England before 1902 was that afforded by the endowed Grammar Schools, many of them with very slender financial resources, and the Higher Grade Schools carried on—illegally, as appeared from the Cockerton judgement—by certain of the School Boards in the larger towns. The total number of pupils in these schools was small, and comparatively few of them entered productive industry on leaving. This fact made it inevitable that the great bulk of the students at evening technical schools (as the 'science and art schools' were beginning to be called) had completed their full-time education in elementary schools. There are no figures available in support of this statement, but any one who was familiar with the technical schools of the early twentieth century will agree without question that practically the whole of our technical education at that time was post-elementary in character. It was this fact that made the reorganization of the evening continuation schools urgently necessary; they could be improved within certain limits very rapidly, whereas the development of a complete system of secondary education was obviously one which could be brought about only slowly.

Although the Board of Education took the important step of placing the evening continuation schools and the technical schools under a single administrative branch in July 1901, the two grades of school were for more than a year under different local organizations. The continuation schools remained under the control

of either the School Boards or bodies of voluntary managers, and the technical schools under that of the Technical Instruction Committees, until the Education Act of 1902 came into force. This circumstance did not altogether prevent progress being made in the co-ordination of the two types, but progress became much more rapid when the Local Education Authorities, armed with extensive powers, came into existence and assumed responsibility for all forms of publicly provided education within their respective areas, except that given in universities. The old distinction between the evening continuation school and the technical school remained. The former, carried on, as a rule, by elementary school teachers in the buildings where they were employed during the day, aimed at continuing and extending the elementary education of their pupils. The latter, taught by men with qualifications obtained either by attendance at science and art schools or, much more rarely, by studies in universities, gave specialized instruction, of which the great bulk was related to the industrial needs of their students, although in some instances attention was paid to the claims of commerce and of certain non-vocational subjects, the latter including very often some, such as botany, zoology, and geology, selected from the list of those on which the Science and Art Department had formerly paid grants.

Since the specialized instructions of the technical school demanded for its proper comprehension more knowledge than could be given to an immature pupil in an elementary school, it was natural that an attempt should be made to convert the old continuation school, with its miscellaneous collection of heterogeneous subjects, into an organized institution which should bridge,

so far as was possible under the conditions, the wide gap between the elementary school and the technical school. This is of interest, since it represents the first attempt in the sphere of technical education to think of schools in terms of their special functions, and to make provision accordingly. We saw, in the quotation from Lord Brougham's article, that the old Mechanics' Institute had a twofold aim—that of teaching the rudiments and that of teaching the scientific basis of industry. Now we see the start of a movement to entrust each of these functions to a separate type of institution, and this start made with a clear definition of the aims of each type We shall come across other instances of the separation of functions into different types of school as our examination of the system proceeds.

It must be taken into consideration that in 1902 the normal age at which children became free from the obligation to attend school was 13, although in a few towns it was as high as 14. Further, in some parts of the country, and especially in the textile districts of Lancashire and Yorkshire, many children attended school for half-time only, after they had reached the age of 12, the remainder of their time being spent in employment. There was thus a need for the evening continuation school to cover a period of at least two years, since the earliest age at which a boy could usually derive much benefit from attendance at the classes in science and technology provided by the technical school was about 16. In some places, where the half-time system was prevalent, the course was organized to cover three years.

As regards the content of the course, there were two aims to be borne in mind Usually, in urban districts, the primary aim was that already mentioned—

the preparation of the pupils for entering the specialized classes of the technical school with some prospect of making reasonable progress; but the secondary aim, which was also present, was that of extending the outlook and improving the qualifications of those pupils who would not proceed to the more advanced instruction of the technical school. Since the first aim was regarded at the time as the more important, it became customary to impart to the curriculum a bias towards one or other of the groups of subjects studied in the technical school; and this led to the division of the pupils of the continuation school according to their occupations, or, at any rate, according to their industrial ambitions. The groups of pupils no longer studied several subjects, chosen very often in a haphazard way, but followed a 'grouped course of instruction' which included several subjects selected according to a definite plan. These courses were divided into (*a*) Industrial, (*b*) Commercial, (*c*) Rural, (*d*) Domestic, and (*e*) General.

The organization of the evening continuation school in England remains after thirty years in principle as described above, though there are modifications in detail and certain local variations have been made. The most important courses, from the point of view of education for industry and commerce, are those first mentioned—the 'Industrial' and the 'Commercial' courses. Of the 'Rural' course, it may be said at once that the number of rural schools carried on in the evening has greatly declined during the last few years, and that this course is very seldom followed; the 'Domestic' course is carried on in a large number of schools attended by girls and women; and the 'General' course, which was at first followed very rarely, is more

frequent than it was some years ago. It is proposed to consider at length only the courses of very direct importance to technical education.

THE INDUSTRIAL COURSE

In drawing up this course, the starting-point was the view that every boy going into productive industry should be able to make workshop calculations, to read a drawing, and to express himself easily and accurately, both orally and in writing; it was considered desirable that he should know something of 'the science of common life' also, though this was not at first regarded as absolutely essential to his equipment. The courses arranged for industrial students normally include therefore:

(*a*) Elementary mathematics.
(*b*) Technical drawing.
(*c*) English.
(*d*) Elementary science (sometimes replaced by manual instruction).

The standard aimed at in mathematics and technical drawing may be described by quoting an instruction given to teachers many years ago by a Local Education Authority:

'At the end of their two years' course, the students should be able to take any simple geometrical solid, such as a hexagonal prism, make a dimensioned hand-sketch of it, and a drawing to scale showing plan, elevation and a simple section. They should be able also to calculate, in either the English or the Metric system, the area of its faces, its volume, and (given its Specific Gravity) its weight; they should be familiar with the use of simple equations, square root, and proportion.'

The instruction in science included mainly mechanics, a little physics, and occasionally some account of the properties of air and water.

THE COMMERCIAL COURSE

From the initiation of this course the main subjects have been arithmetic and English, as a knowledge of these must form part of the equipment of every one who is concerned in any way with commerce. The arithmetic has usually a bias towards the needs of commerce, but English is taught, quite properly, with no regard whatever to the fact that the students are engaged in commercial occupations. In addition to the two main subjects, it is the practice to include instruction in shorthand and often in the elements of accounts It is somewhat remarkable that the subject of geography, in spite of its value from both the educational and commercial points of view, receives little attention in many commercial courses.

Both the industrial and the commercial courses are still of the general form just described, and there is no doubt they constitute a basis for further studies of a specialized kind in the technical school itself. The criticism is sometimes made that the industrial course is more suitable for the future student of engineering than for others. On the whole, however, it is not ill adapted to the needs of boys who are entering other manufacturing industries, and the criticism need not be taken too seriously.

It is, however, probable that the evening school courses just described (which are often known as 'Junior Courses') have outlived much of their usefulness, though they will certainly be necessary to some

extent in the future. It has already been stated that they were originally planned when the leaving age of the elementary school was 13–14, and when technical education was overwhelmingly post-elementary in character. Now, we have a large number of full-time schools with a leaving age of 15, as well as of secondary schools with a leaving age of 16 or more, and boys from these fresh types of school are entering the evening technical schools in increasing numbers. Already it has been found necessary to plan more advanced instruction in Junior Courses for boys who have attended a day school for about a year beyond the age of 14, while boys who have completed the course of a secondary school can enter the technical school and profit by their attendance without any intermediate training in a Junior Course. The proportion of boys entering evening technical schools after finishing their full-time education at the age of 14 is thus diminishing; and accordingly the need for industrial and commercial courses of the 'Junior' grade is also diminishing.

It seems likely that if the system of evening continuation schools is to continue on its present scale, it will be necessary to consider the establishment of more courses of a general kind, where youths can pursue their hobbies and learn the right use of leisure. Something is already being done towards the setting up of schools of this kind, notably in London, whose Education Authority has founded a number of Institutes for men and women, as well as for boys and girls. These Institutes are extremely successful in the accomplishment of their expressed aim. They are mentioned as illustrating what seems likely to be the line of development of the evening continuation school, which has

served the country so admirably as a vocational institution during a period—happily now ending—when higher elementary and secondary education were not fully provided.

CHAPTER VI

THE EVENING TECHNICAL SCHOOLS

THEIR RANGE OF INSTRUCTION

CONCURRENTLY with the development of the evening continuation school as an organized institution, with a clear definition of its aims, came the corresponding development of the evening technical school. After 1890, the Technical Instruction Committees established under the powers conferred on authorities by the Technical Instruction Acts had in theory the right to provide any kind of instruction which they deemed suitable to the local conditions, defraying its cost from the local rates and their proportion of the whisky money. In actual practice, however, it was usual for these Committees to confine their activities mainly to the provision of classes which were eligible for earning grants from the Science and Art Department, or, at any rate, were recognized by the City and Guilds of London Institute. The range of instruction was therefore somewhat narrow; and naturally so, since the syllabuses published by these two examining bodies afforded the only guidance available for the teachers, most of whom, being employed for part of their time only, had neither the opportunity nor the experience necessary for planning courses of work for themselves; they were in fact amateurs, and were not fully competent, as a rule, to undertake the work of professional teachers.

It was not until 1904 that the Regulations of the Board of Education were so modified as to make instruction in almost any branch of knowledge eligible

for State aid by means of grants. This had an immediate effect on the range of instruction provided, but its considerable extension had to await the employment in the larger institutions of teachers who either devoted their whole time to the work, or had had the advantage of a better previous education than their predecessors.

The range of the instruction in an important technical college is now extremely wide, subjects such as engineering, chemistry, and building having been divided and sub-divided until in each sub-division there is scope for the employment of highly trained expert teachers. To take one example—the instruction in chemistry now includes not only pure chemistry, but also coal-tar products, dye making, fuels, gas manufacture, glass making, ferrous and non-ferrous metallurgy, leather manufacture and dyeing, oils and fats, painters' oils and colours, pottery and porcelain manufacture, the rubber trades, and textile chemistry.

THE GROUPED COURSE SYSTEM

One of the earliest developments in English technical education after the opening of this century was that of the system of 'grouped courses of instruction', and the speed with which the classes of the evening technical school, formerly so separate and heterogeneous, were organized into coherent units is remarkable. It is true that courses of instruction were in existence in the Sanitary Engineering department of the Manchester Technical School as far back as 1890, while in 1898 similar courses were organized in the textile department of this school; but it was not until 1901 that the system was in full operation in Halifax

and St. Helens, though it was in partial operation in the former town in 1898. The development of grouped courses after 1902 was very swift in the north of England, and by 1905 as many as 29 of the 34 towns in Lancashire, Cheshire, and Yorkshire mentioned in the Board of Education survey of the Course system had established such courses.[1] The development was slower in other parts of the country and it was not until 1913 that the system was definitely adopted in London. The credit for the invention of the Course system is sometimes claimed for this or that person, but in fact it was not invented by any individual; its utility became obvious to a number of persons interested in technical education at about the same time, although its feasibility was somewhat doubtful until some one had the courage to test this. What credit there is belongs to the pioneers who showed this courage. The Annual Report of the Board of Education for 1924–5 says quite aptly:

'No highly organized structure could have been predicted for an evening school system designed to attract, and reasonably to satisfy the demand of, a large voluntary attendance of young workers But the conception of a grouped course of study in which there is a balanced combination of subjects to be studied throughout a school year, or a succession of school years, by an attendance on two, or, more commonly in the case of boys, three evenings a week, has from the early days of evening schools commended itself locally and centrally as a means of organizing evening study.'

The effect of the development of grouped courses was generally to replace what was often unregulated

[1] *Board of Education Pamphlet*, No. 19, 1910.

attendance and unco-ordinated study by continuous and properly graduated schemes of instruction. From the time of the adoption of the course system the unit of study was the group of subjects set out for a body of students, with like aims and approximately similar attainments, who were willing to attend a technical school for three evenings a week during the winter months, for a period of three—or more rarely—two years. This is still the unit of organization, though the system of grouped courses has been elaborated in detail as a result of the experience gained with it during the last thirty years.

Generally, the whole scheme of evening instruction is divided as follows:

The Junior Course.[1] This is planned to cover the two years between the ages of 14 and 16 and is taken in an evening continuation school. It is not specialized in accordance with particular needs, but is intended to give a good general basis for the vocational studies of the technical school.

The Senior Course. This is planned to cover three years from about the age of 16 and is taken in a technical school. It is specialized, usually in accordance with the educational needs of different branches of industry and commerce. The students entering this course are expected to have had a suitable previous education, either in a continuation school, a secondary school, or some other school with a leaving age higher than 14.

The Advanced Course. This is planned to cover two—or rarely three—years and is taken in the more important technical schools. It is based on an appro-

[1] Discussed in Chapter V.

priate Senior Course, but usually gives the student greater freedom of choice than is permitted to him in that Course.

This general scheme exists throughout the country, and it is a matter for satisfaction that not only students and teachers, but also many business men who are actively interested in technical education, understand thoroughly both the system and its nomenclature; it is indeed frequent to hear industrial members of Advisory Committees on technical education for their particular branch using such abbreviations as 'S 1', 'S 2', &c., instead of the more formal descriptions of the first and second years of a Senior Course of instruction.

The great bulk of the students in evening technical schools are in attendance at a Senior Course; many of them cease their attendance when they have received some testimony of their satisfactory completion of this stage, and there is no doubt that the students who follow with credit an Advanced Course constitute a body of young men of excellent ability and high qualifications.

Each branch of industry or commerce for whose educational needs the school provides has its own grouped courses. Although these are normally self-contained, at any rate in the larger schools, it is not unusual for students from more than one course to be in attendance at the same class when the subject is of common value to both courses. Thus, a class in mathematics may have students from engineering and building courses, or a class in economics students from banking and insurance courses.

In spite of the very great value of the Course system, its introduction has not been an altogether unmixed

benefit. It is peculiarly suitable for the students of vocational subjects, but is not so suitable for some non-vocational subjects. For example, it is possible to derive a good deal of interest and satisfaction from attending a technical school for the study of geology or biology, or for cultivating an interest in the language and literature of either England or some other country; and studies such as these can profitably be followed without the necessity of attending organized classes on three evenings a week for a period of three years. When the Course system was started, a good deal of pressure was exerted on students to attach themselves to one or other of them, as was indeed very natural; but the effect was that some of the subjects, which did not lend themselves readily to this form of organization, received comparatively little attention, even in schools where they had formerly been taught with enthusiasm and success.

THE CONSTITUTION OF COURSES

It is sometimes assumed that the various technical courses have the same kind of constitution, but an examination of them shows some fundamental differences. Some consist of a main central subject with which others, which are really ancillary to it, are associated. The normal course of the Senior grade in cotton spinning, for example, is of this type, since it includes cotton spinning itself, together with mathematics, drawing, and mechanics, which must be studied if any satisfactory progress in the main subject is to be made. The course can quite legitimately be regarded as a single subject which, for the sake of convenience, is divided into several related parts, mutually dependent on one another.

Other courses contain no central main subject, but several subjects which, although essential for the full equipment of the student, can be learned separately. Thus, a Senior Course in mechanical engineering usually includes machine construction and drawing, mathematics, and engineering science. It is true that mathematics is ancillary to engineering science, and that a knowledge of elementary mathematics is of use in learning machine construction; but it is quite possible, at this stage, to make progress in either machine construction or engineering science without much study of the other. Exactly the same applies to many of the Commercial Courses; book-keeping and commercial arithmetic are related to one another, but geography, which may be included with these two subjects in the same year of a Senior Course, has no apparent relation to either of them We can thus distinguish between courses which consist of main and ancillary subjects, and courses which include subjects whose only real relation to one another is that they are essential to the proper preparation of a student who has a particular end in view.

MINOR AND MAJOR COURSES

It has been stated earlier that the English tradition is against using the school for imparting skill in manual operations and in favour of confining the instruction to teaching underlying principles. This tradition shows signs of breaking down, though the break has not yet gone very far; it has gone farthest in the case of the building crafts, where it was first observable. It is likely that one reason for the early departure, in this instance, from the strict doctrine was due to the very sensible view that the health of the population of the

country depends on good sanitation, and that this in its turn is dependent on efficient plumbing. Whether this surmise is correct or not, there is no doubt that it was in connexion with the teaching of plumbing that instruction in the actual practice of a craft first started on any considerable scale. When once the principle of giving workshop instruction to a particular type of workers had been admitted, there was no valid reason for refusing to permit the practical training of other craftsmen, and accordingly classes in carpentry and joinery, plastering, pattern making, acetylene welding, and other crafts exist in a number of technical schools. Although the volume of instruction of this kind is usually quite small in any single school, the aggregate in the country as a whole is certainly considerable. Care is always taken, however, to associate the teaching of the craft with that of such subjects as mathematics, science, and technical drawing; in other words, a grouped course system has been established on the same model as that for students interested in an industry generally rather than in a craft, or a single occupation within an industry. The courses included within this system are sometimes called 'Minor Courses', while the others are termed 'Major Courses'.

Difficulty tends to arise in the organization of Minor Courses through the circumstance that it is often impossible to make them self-contained; it is frequently found necessary to include in them certain theoretical subjects which are also included in Major Courses in the same school. The distinction between the two types of course is thus to some extent blurred, and this is unfortunate, since it is very real. The difference at bottom is not merely that the Minor Course emphasizes the importance of the craft, or series of workshop operations, and lays

less stress on the underlying principles; it is that the Major Course, if properly conceived, aims at teaching principles of general application to the whole of the operations which taken together constitute an industry, while the Minor Course aims at teaching only those branches of knowledge which are immediately applicable to the practice of a particular occupation within an industry.

The amount and nature of the instruction given to students following Minor Courses is therefore in general too narrow to form a sufficient basis on which to found a stable Major Course, and due regard should always be paid to this important fact. In the early days of Minor Courses, attempts were frequently made to plan them so as to lead directly to Major Courses; that is, in some instances the Minor Course was completed in two years (as indeed many are at present) and its satisfactory completion entitled the student to enter the second year of a Senior Major Course. If this arrangement can be made without distorting either of the Courses, well and good; but it is more satisfactory to plan the two types of course independently of one another. A factor which has certainly influenced some schools to obliterate as far as possible the distinction between Minor and Major Courses is the very natural desire of their Principals to afford every opportunity to capable and ambitious students to enter the Major Course, with its greater scientific content and its better material prospects, even if they begin in a course which undoubtedly makes smaller intellectual demands on them. This is a desire which every one who knows evening students will share, but it should not be met if it involves diminishing the effectiveness of either one of the Courses.

THE STUDENTS IN PART-TIME TECHNICAL SCHOOLS

The evening classes of the technical school are frequented by students in their spare time at the end of their day's work; and since attendance is voluntary, the motives impelling attendance are of interest. They are very mixed. The desire to rise to a higher position in the industrial or commercial world; interest in the pursuit of knowledge irrespective of its economic value; the liking for the social life of the school community; the influence of tradition in those districts of the country where attendance at evening classes has been customary for generations; the encouragement of older persons, including parents, teachers, and employers; all these are amongst the motives which influence young people to join technical school classes, and probably all of them exist in every large school of this kind. It is certainly true that most students—probably all of those who maintain their attendance for a number of years—are impelled by ambition, for they have examples before their eyes of men who have attained responsible positions through their diligent studies in the technical school; but there is no doubt that this is not the sole motive, since it is unreasonable to assume that a youth of 17 or 18 will persist in his attendance night after night for winter after winter because of the prospect of a material reward at the age of 25. The other reason for his continued efforts is undoubtedly the intellectual interest aroused in him. The capacity for prolonged interest of this kind is by no means universal, and accordingly it is found that every year a number of students cease their attendance without completing the course on which they have started. Only those who possess considerable persis-

tence, and the physical fitness needed for bearing the strain which continued attendance and regular home-work impose on them, actually finish the courses laid down; there is no doubt, however, that those who work diligently for even one or two years derive a good deal of benefit from their systematic studies.

During the last ten years, the proportion of students attending evening technical schools after a prolonged general education in either a central or a secondary school has greatly increased. It is unfortunate that no record has been kept nationally of the gradual change in the educational antecedents of those joining technical schools; from the records kept by individual schools in different parts of the country it appears, however, that not far short of half the evening students attending technical classes have had a full-time education longer than that of the elementary school. This is a very significant change, and must have important results. These are discussed in a later chapter, and all that need be said here is that the presence of such a large proportion of well-prepared students must have the effect of making greater demands on the energies and knowledge of the teachers, since the level of the instruction provided for, at any rate, these young men must be raised to a higher standard.

CHAPTER VII

SPECIAL CHARACTERISTICS OF THE INSTRUCTION IN TECHNICAL SCHOOLS

TWO TYPES OF TECHNICAL EDUCATION

THE present wide range of vocational subjects in technical schools has grown out of the syllabuses of instruction in science drafted soon after the middle of the nineteenth century by the Science and Art Department, and those in technology issued by the City and Guilds of London Institute after its establishment in 1879; and it still shows traces of its origin It includes, like the list issued by the Department, subjects which are either pure science or are concerned almost entirely with the definite and direct application of science to industry; and, like the list issued by the City and Guilds of London Institute, it includes subjects bearing on industries which even now are carried on by traditional methods, since the application of science to their practice is not yet fully possible

The distinction between these two groups of subjects—for they are two groups, although the line of demarcation between them is becoming less clear—is not, however, due to the mere fact that one group had its origin in the Science and Art Department and the other in the City and Guilds of London Institute. It proceeds from causes which are fundamental and not from just the accidental circumstance that two examining bodies, staffed by men with different experience and outlook, determined the nature and scope of the studies in English technical schools for more than half a century.

The essential factor is that the conduct of industry is necessarily empirical until progress has been made in

science and in the ways of employing scientific knowledge for solving the problems which arise in the production of commodities on the large scale Technical education, in the sense of training the personnel of industry in the methods of applying to workshop processes certain underlying principles, must obviously wait until these principles are discovered and made known; in other words, its development depends on scientific and industrial research. This is a fact whose importance it is difficult to over-estimate.

Looking now at the different industries of the country, it is not difficult to see why engineering and the industries involving the use of metals were the first to become scientific in character. The engineer is using materials of constant composition, whose strength, durability, and other properties are readily ascertained; the behaviour of these materials under varying conditions has been studied by scientific men for generations, and the influence of a mixture of other materials on this behaviour is well known; further, a large proportion of the problems which confront the engineer are capable of solution by the aid of mathematics, a branch of knowledge which was quite advanced when technical education began, since it is one of the oldest of sciences The textile spinner or manufacturer, on the other hand, is using as his raw material something whose chemical composition is complex, and in some cases not well known. Where it is known, its relation to working qualities has not been completely ascertained; and the raw material, even in a small sample, is a mixture of fibres differing from one another. It is therefore not surprising that the scientific foundation on which sound, consistent industrial practice can be based remains still to be elaborated for the textile industries. Technical education for the

industries of engineering and chemical manufacture, for example, is, from the relatively advanced state of scientific knowledge and of industrial practice, something essentially different from technical education for the industries whose scientific progress has been more difficult and therefore slower

EDUCATION FOR THE MORE SCIENTIFIC INDUSTRIES

The scientific basis of engineering and the chemical industry has been the subject of study in universities for many years, and the instruction for men engaged in these industries which is provided in technical schools is greatly influenced by this fact, since the heads of their engineering and chemical departments have usually graduated in one of these branches of knowledge in universities. The curriculum of the Senior and Advanced Courses of a part-time technical school normally includes mathematics, machine construction and drawing, and engineering science, that is, applied mechanics and heat engines. It is predominantly scientific in content and deals to a very limited extent with the actual, concrete practice of the workshop. A youth who is engaged in one of the craft operations of engineering, and intends to remain a craftsman, will rarely find much of direct value to him in the engineering classes of his local technical school, although doubtless he will derive benefit of an indirect kind from the ordinary curriculum. The fact is, however, that his needs have not been carefully considered in the country as a whole; engineering instruction, generally speaking, is far better suited to the needs of the student who is ambitious to rise to a position of considerable responsibility in the industry than to those of the student who has the

equally laudable ambition of becoming an excellent craftsman.

So far as preparation for employment in the chemical industries is concerned, the curriculum includes physics, chemistry, and mathematics in the Senior Course, no specialization in accordance with the special character of any of its branches being usually permitted, although there is often some degree of specialization in the Advanced Course. This is sound, since what a chemist requires is first of all a wide and thorough knowledge of principles before he begins to think of their application to any manufacturing operation. There is no instruction provided for the rank and file of the chemical industries, and in view of the fact that what these workers need is care and intelligence in carrying out the instructions of skilled chemists, rather than a slight knowledge of chemistry and physics, this arrangement is very suitable.

EDUCATION FOR THE LESS SCIENTIFIC INDUSTRIES

Belonging to the other type of grouped courses are those for students of textiles, building, boot and shoe manufacture, baking and confectionery, for example. The pioneers of the classes for students engaged in these industries had before them the task of planning syllabuses and schemes of instruction without being able to base them on a well-established foundation of pure science. They did the only thing possible in the circumstances, that is, they started with the existing knowledge needed by craftsmen, foremen, and managers engaged in the works and drew up syllabuses incorporating this knowledge in a systematic scheme of examination and associating with it the necessary amount of calculation and drawing.

The point of departure was thus at the end opposite to that selected in the case of the scientific industries; the ordinary practice of the works was explained as far as possible and, as time went on and the course system developed, additional subjects, such as mechanics and mathematics (in substitution for workshop calculations involving only arithmetic), were associated with the main central subject We see in this growth the reason for the present character of the grouped courses in these branches, to which reference was made in the last chapter; they have been made by the elaboration of a single subject, and not by a process of considering what branches of science are necessary for the foundation of a complete study of the processes of a branch of industry.

THE INFLUENCE OF INDUSTRIAL RESEARCH

The establishment with State assistance of national schemes of scientific research for various important industries is already having some effect on the amount of understanding of the principles which should be employed in efficient industrial practice. Its effect will be still greater when the research organizations have completed their heavy preliminary task of discovering and consolidating that knowledge of fundamentals which is the only sound basis for the erection of a stable scheme of industrial research. The additions already made to the scientific knowledge of industry are sufficient to justify, and indeed to demand, that the technical schools shall take note of them; the Building Research Station carried on at Watford by the Department of Scientific and Industrial Research and the various Research Associations aided by the same Department are now extending the stock of knowledge

relating to the materials and methods of industry, and it is urgently necessary that the young men now entering the industries concerned shall have opportunities of learning of these additions to knowledge. The process, however, of providing these opportunities is slow; it can only be quickened by closer contact between the industries and their research organizations, on the one hand, and the teachers and schools on the other. Anything which will conduce to this is of advantage to the industries and to the nation.

When once the technical schools are in a position to disseminate scientific knowledge relating to industrial practice in the case of the industries at present carried on mainly by traditional methods, it is clear that the instruction over the whole field of technical education will tend to be of the same general character. The teaching of those subjects for which education was first provided in universities will, it may be hoped, continue its progress downwards until it reaches the skilled artisan and cares for his peculiar needs; and the instruction which began by an explanatory description of industrial operations will ultimately attain to the plane of studies in a university.

THE ARRANGEMENT OF SYLLABUSES

It may be worth while, at this point, to say more of the type of technical education which began with the workshop and its operations. There was a natural tendency when planning syllabuses for this group to assume that the order of the workshop operations was the right order in which to present knowledge to the student. Thus, the syllabus in cotton spinning began with the treatment of the cotton bale, and went on to describe in detail the ordinary sequence of operations,

that is, scutching, carding, drawing, roving, and spinning, which come between the bale of raw cotton and its packing as finished yarn. It has been considered in more recent times that this order is not necessarily the best, and that it is sounder to treat of the functions which are being performed rather than of the machines which perform the functions; the result of this reconsideration has been a recasting of the syllabuses.

The development of mining education during the last few years is of special interest, since its progress indicates very clearly the direction in which education for both the textile and the building industries is now tending, a direction in which these branches of technical education must travel if they are to continue to be suitable for the needs of modern industries into which the methods and results of scientific investigation are beginning to penetrate. For many years the teaching of coal-mining consisted in describing to the students the ordinary operations of mining practice in what may be termed the historical order. First of all, they were informed as to the methods of sinking shafts; they then went on to learn how roads are driven, and how coal is won, hauled, and wound to the surface; finally, they got to know something about ventilation and the mechanical equipment of a colliery. The present practice is entirely different. It consists in organizing the Senior Course mainly as a group of science subjects, that is, physics, the elements of chemistry, and engineering science, illustrated wherever possible from mining practice. It is not until the student has a fair knowledge of these topics that he is permitted to undertake the study of the application to the practice of mining.

EDUCATION FOR THE MACHINE-USING INDUSTRIES

Technical education for what may be termed 'the machine-using industries' presents difficult problems which may well be discussed here. These problems occur in an extreme form in boot and shoe manufacture and textiles. One of them is concerned with the method of making use for educational purposes of mechanical equipment devised for industrial production and for nothing else, and therefore lacking in flexibility and ready adaptability to the instruction of students at different stages of knowledge. A comparison of the workshop equipment of a technical school with its equipment for teaching physics, applied mechanics, or chemistry will indicate where the difficulty in employing it educationally lies. The equipment of a physical laboratory consists of apparatus designed and manufactured for the purpose of experiment and not for that of production An optical bench, a calorimeter, or a Wheatstone's Bridge are all capable of a wide range of experiments; all of them are simple, need no mechanical power, and are ready for use by one student as soon as another has finished with them, even if the second is in a higher or lower stage of advancement than the first A laboratory for teaching applied mechanics is equipped on similar lines and its apparatus is just as adaptable, while much of the apparatus used by the chemist consists either of small units —tubing, flasks, corks, condensers—which he builds up into combinations suitable for his different purposes, or of such objects as burettes, pipettes, thermometers, and balances, each of which serves one quite simple purpose.

The problem of using the ordinary, power-driven

machinery of industry for educational experiments in a school workshop is obviously much more difficult than that of making use of the apparatus, skilfully and specially devised, of a physical, mechanical, or chemical laboratory. Sometimes there is another complication in the use of the school workshop, since a machine may not only have been built or adjusted with a particular end in view, but it may actually contain material in three stages, that is, raw material, finished material, and material in process of conversion. For example, a loom will usually contain the warp threads on the beam, the cloth, and, in addition, the warp threads arranged in the healds and reed in a definite order which cannot easily be modified; when a student leaves a loom in this state, as he must, the conditions for the student who follows him are to a great extent determined. This aspect of the problem is not quite as difficult in a boot and shoe school, since the materials on which operations are being conducted are not continuous lengths, but are small separate pieces, easily detachable from the machine; it is, however, by no means simple

The general problem is perhaps not completely soluble, but there are two directions in which a partial solution may be found. The first consists in following, as far as practicable, the example of the physicist, the engineer, and the chemist and either devising special teaching equipment or modifying existing equipment suitably. Progress has been made in this direction, notably by Mr. W Wilkinson, Principal of the Blackburn Technical College, who has designed and installed an experimental loom, which is capable of far more easy adjustments —and incidentally of more quantitative experiments— than the ordinary loom; and it is desirable that this

example shall be widely followed by teachers connected with instruction for other industries.

The second consists in postponing the use of the machines in the school workshop until a later stage in the courses of instruction than is usual. This plan is eminently desirable on educational grounds alone, quite apart from those of convenience in the use of the workshop as a laboratory. There is an inevitable tendency for the teacher, faced with the awkward task of utilizing ordinary plant, to use the machine very much in the same way as it is used in industry, and to concentrate his attention on the machine itself, showing how it is constructed and how its complicated motions are co-ordinated, rather than on indicating how it is designed to exercise a required effect on the material presented to it, and what this effect is. To put it briefly, there is often too much attention paid to the construction and working of the machine and too little to the job it is doing.

In very many instances, the machine is simply performing, more rapidly and more accurately, what was formerly performed by hand with the assistance of hand tools or simple machines. Accordingly, if a student is to understand what exact operation the machine is to carry out, he will learn a good deal by carrying out that operation for himself, in just the same way as it was carried out before the invention of the power-driven machine now employed in factory production; moreover, he will in doing this gain an acquaintance with his raw materials and their working qualities, which is essential to him, in a way and with a fullness not obtainable by any other means. To take some examples; a youth who has made a pair of shoes by hand, cutting out the uppers, linings, and soles, and sewing

them together in the same way as the shoemaker did years ago, will have learned more about leather and the other materials employed and of their behaviour in working than he could ever gain by watching, adjusting, and controlling the machines used in the factory. Further, when at a later stage he comes to work a power-driven machine in the school workshop, he will realize fully the task it is performing and how it has been planned for its particular purpose. Instances of the utility of preceding the detailed study of machines by carefully planned manual operations, each with a very definite object in view, could be multiplied. Any one who has used his hands and simple tools for planing wood, for carding and spinning raw cotton or wool, for hand-weaving, for sewing cloth, for filing or turning brass and iron, or for sharpening tools, will have a better knowledge of the various raw materials, their constant or inconstant working qualities, and the way they must be dealt with for successful production, than he could possibly gain in any other way. This is the educational justification for planning a series of manual experiments in the earlier stages of the instruction intended for young men who wish to have a thorough knowledge of an industry whose practice consists mainly of the use of machinery for shaping raw materials into saleable goods. The task of devising such manual experiments suitable for carrying out in a school is not always easy; but it is worth doing, and incidentally is as full of interest for a keen teacher as it undoubtedly is, when completed, for his students

CHAPTER VIII •

EXAMINATIONS AND THEIR INFLUENCE ON TECHNICAL EDUCATION

THE UTILITY OF EXAMINATIONS

THE influence on the early development of technical education in England of the examinations conducted by central organizations has already been described in Chapter III; and that of the examinations carried on by newer organizations in the changed conditions is still strong. This is not a matter for surprise, since, in addition to the national disinclination to abandon traditional methods, there is a general conviction that the system of examination current in technical schools possesses great value. For the Local Education Authority it offers an easy means of co-ordinating the functions of different technical schools in its area, defining the range and standard of their work, and measuring with sufficient exactness their efficiency; for the teachers—and especially for those of them who, being employed for part of their time only, have not the professional outlook of the full-time teacher—it affords guidance and assistance by presenting them with curricula and syllabuses of instruction, which they know to be generally acceptable in the educational world; and for the students—particularly that great body of young men and women attending technical schools voluntarily in their spare time—it provides from an authoritative source written evidence of their ability and diligence, which may be of material use to them when applying for employment or promotion. No doubt much can be urged against any

system of external examinations, but it is certain that, in the peculiar circumstances of English technical education, progress would have been much slower and probably less satisfactory if this system had not been created. The system was certainly too rigid at the outset and during the whole of the second half of the nineteenth century; but, in order to be effective, it had to be rigid, since nearly all the teachers were amateurs, very often not much further advanced than some of their pupils, and their careful shepherding during the period of growth was necessary. It would have been satisfactory to all concerned, if from the start of technical education in this country it had been found practicable to frame and secure the adoption of sound programmes of instruction throughout the whole of the country without imposing them on teachers and schools from a central organization; but this was not practicable for many years, not indeed until there was a substantial body of teachers with sufficient experience and general education to be given freedom to plan their own schemes of instruction.

DISCONTINUANCE OF THE SCIENCE EXAMINATIONS OF THE BOARD OF EDUCATION

The first step in the direction of giving greater liberty to the schools and increased flexibility to their curricula was taken in 1911, when the Board of Education announced their intention to discontinue their science examinations of the lower grade; at the same time, they expressed their willingness to endorse certificates issued by school authorities (and incidentally by the City and Guilds of London Institute) attesting the satisfactory completion of well-balanced courses of

study by students who had reached a proper standard in the several subjects of the course.' This was a step of considerable importance, since it marked the beginning of the end of rigid control from the centre, although an attempt was made to retain national standards of certification. After some years, the Board discontinued all their science examinations except those which are necessary for the award of certain scholarships. The City and Guilds of London Institute followed the example of the Board of Education by discontinuing their lower examinations in 1918, but they retained their examinations of Final Grade.

Experience has shown that the proposal that schools should issue their own certificates, endorsed by the Board of Education with a national hall-mark, was not generally acceptable There were two reasons for this. First, there was, and still is, a strong opinion amongst teachers, Education Authorities, and certain industries interested in the technical education of their recruits, that the national standards of attainment which all regard as desirable cannot be established by means of examinations that are entirely internal, even if there is some scheme of supervision by the Board of Education. In the second place, the scheme of endorsed certificates awarded on the results of internal examinations conducted by the schools themselves was quite convenient for the larger institutions, with their full-time staffs of professional teachers, but it proved to be unworkable in the case of the smaller schools. It was accordingly taken up by the larger schools only, and even amongst these many did not adopt it.

THE REGIONAL EXAMINING UNIONS OF AUTHORITIES

The demand on all sides for examination tests at appropriate stages in the various courses, and the failure of the early scheme of internal tests coupled with external endorsement, which had been put forward by the Board of Education, afforded the opportunity for certain unions of Education Authorities and schools to develop further the examining work they had previously carried on.

These unions are the Union of Lancashire and Cheshire Institutes, which has been in existence since 1839, the Union of Educational Institutions, which began as the 'Midland Counties Union' and subsequently extended its area so as to cover a very large tract of country, and the East Midland Educational Union; more recently the Northern Counties Technical Examinations Council has come into being. In addition, there are examining bodies constituted by the large single Authorities of Kent and the West Riding of Yorkshire. So long as the Board of Education and the City and Guilds of London Institute were examining in both the lower and higher grades of the subjects they covered, these unions had confined their activities mainly to the subjects and stages not touched by these organizations, since their certificates, being local in character, had not the same prestige and could not compete with certificates issued by national organizations. With the disappearance of so many examinations conducted centrally, there was obviously a fresh field for them to enter, that vacated by the Board of Education and the City and Guilds of London Institute. They were not slow to enter it and their organization developed rapidly until now, in their

respective regions, they have fairly complete schemes of examination, that of the Union of Lancashire and Cheshire Institutes being the most elaborate and comprehensive.

Generally, the work of the unions consists of (*a*) drafting curricula and syllabuses of examination, and (*b*) examining and certifying the successes of candidates. Unlike their predecessors as examiners, they include within their scope the examination of students in attendance at evening continuation schools, but they cover also the Senior and Advanced instruction of the technical schools. The task of framing curricula and syllabuses is entrusted to Advisory Committees, each dealing with a particular branch of instruction The majority of the members of every Advisory Committee are teachers, elected by their colleagues in the region as their representatives, while the remaining members are officers of Local Education Authorities and, in recent years, representatives of the industries concerned; with these members it is usual to associate on each Committee an Inspector of the Technological Branch of the Board of Education, who possesses suitable qualifications.

The examination papers are set and marked by external examiners, but both the question papers and the marked scripts are subjected to the scrutiny and, if necessary, the revision of moderating committees of suitable constitution. The whole system of examination is thus partly internal and partly external. It is working smoothly and satisfactorily.

It will have been observed that the 'regional examining bodies' (as these unions are often called) have been set up for only part of the country; and even in the regions themselves there are schools which do not pay

them allegiance. It has been suggested that similar organizations should be created in other parts of the country with the same functions, so that the whole of the technical schools would come within the scope of one or another of them; but this is not, at any rate at the present time, a feasible proposition The great strength of the existing unions depends to a considerable extent on two factors: in each of them as at present constituted there are sufficient candidates to ensure the economical working of the scheme, again, each of them is so compact that it possesses a centre so situated as to be within cheap and easy access by representative teachers from every part of its region. Manchester, Birmingham, Nottingham or Leicester, and Newcastle are such convenient centres for the respective unions now in active operation But any region where the schools are so scattered, or so few in number that the total number of candidates would be comparatively small, or which does not possess an easily accessible centre for the necessary meetings of committees would, under existing conditions, have considerable difficulty in initiating and carrying on with economy and efficiency a regional organization of the type with which those concerned with technical education have become so familiar during the last twelve or fifteen years

EXAMINATIONS IN AREAS WITHOUT REGIONAL UNIONS

So far as the districts not covered by regional unions are concerned, the technical schools submit their students for the examinations of bodies which are organized on the basis of subjects of instruction rather than on that of locality. Thus, many students take the

examinations of the City and Guilds of London Institute, which has now, by agreement with the Board of Education, restored some of its lower examinations which were formerly abandoned; others take the commercial examinations of the Royal Society of Arts and the London Chamber of Commerce; there are also the professional examinations for admission to learned Institutions, and, in addition, examinations conducted by bodies of minor importance.

NATIONAL CERTIFICATES

One of the most interesting and important developments of the examination system during the last twelve years has been the scheme for the award of what are known as 'National Certificates' by the Board of Education acting in co-operation with a professional Institution. This co-operation began in 1921 with a scheme for the award of 'National Certificates' jointly by the Board of Education and the Institution of Mechanical Engineers to students in technical schools who had satisfied certain conditions upon which the two co-operating bodies had formally agreed As this scheme proved so successful, it has been followed by others in which the professional Institutions concerned are respectively the Institution of Electrical Engineers, the Institute of Chemistry, the Institute of Builders, and the Institution of Naval Architects; with the last named of these is associated the Worshipful Company of Shipwrights. A scheme of co-operation between the Board of Education and the Institution of Gas Engineers has also been in existence for about ten years, but it is not, strictly speaking, a National Certificate scheme, although it possesses the same national character. It is probable that the Board of Education will soon complete a scheme

for the award of National Certificates jointly with the Textile Institute, the discussions to this end having reached an advanced stage.

It is provided in each scheme that the Board and the professional Institution—which is always one of very high standing—shall determine the range and the standard of the work for which they award their certificate; at the same time, great care is taken to ensure that the school shall invariably have the greatest amount of freedom in the organization of its work and in the testing of the performance of candidates for National Certificates which is compatible with adherence to an approved course of instruction and the maintenance of the standards laid down by the Awarding Bodies.

The essential features of the method of co-operation will be seen if a description of one of the schemes is given Each school wishing to participate in it submits to the Board of Education its programme of work in the appropriate branch of instruction, showing in detail what its curriculum and syllabuses are for the complete course. This may be a Senior Course, which must extend over three years, with a minimum in each year of 150 hours of teaching, or an Advanced Course, which must extend over at least two years, with the same minimum number of hours of instruction. The conditions of admission to the course, the names and qualifications of the teachers, the conditions of promotion of students from year to year and other relevant information are submitted with the programme. The proposals are considered by a Joint Committee, representative of the Institution and the Board of Education, the members nominated by the latter body being Inspectors of the Technological Branch of the Board with an expert knowledge of the branch of knowledge

concerned. In addition to the information furnished by the school, the Joint Committee have at their disposal the knowledge possessed by the Inspectors of the general conditions under which the instruction is given, such, for example, as the suitability of the buildings and equipment. After consideration of the proposals and with a knowledge of the attendant circumstances, the Joint Committee recommend to the Institution and the Board of Education either approval (conditional or unconditional) or, in rare instances, disapproval; if they recommend approval, the Board notify the school concerned.

Once a programme has been approved, the school proceeds to carry it out without further correspondence on the matter, promoting the students from year to year of the course until they are in the Final Year and elect to submit themselves for examination. The examinations in the Final Year, like those for promotion purposes in the preceding years, are conducted by the teachers themselves; in this year, however, there is the important difference that the questions set at the examination must be submitted to the Institution for review by an 'assessor', who is appointed by, and is responsible to, the Institution and to it alone. He has the duty of seeing that the questions cover the syllabuses fairly and adequately, and that they are of suitable standard; if he thinks fit, he may revise the questions, substituting or adding others up to a certain limit. It is only when he is satisfied that the questions are approved for working by the candidates. After the examination, the teachers mark the scripts, which in their turn are sent to the Institution for moderation by the assessor. In actual practice the assessor devotes most of his attention to the border-line cases, unless

he has reason to believe that the standard of marking is not generally satisfactory. He has the right, however, to alter the marks awarded by the teachers, since he carries the responsibility for ensuring that, as far as possible, the same standards are maintained, not only over the whole of the schools submitting candidates in any one year, but also over a period of time.

In determining whether a student who has satisfied the examiners shall receive a National Certificate, the marks he has obtained throughout his course for homework, class work, laboratory and other exercises, as well as his average attendance, are taken into account. It is only when the Institute and the Board are satisfied that the student has been diligent during his attendance, as well as satisfactory at his examination, that he receives the award of a National Certificate.

It has been found practicable to bring the regional examining unions into the administration of National Certificate schemes by arranging that schools may submit for approval the various curricula and syllabuses planned by their Advisory Committees, and that their examiners shall play the same part as is played by the teachers in an individual school not working in co-operation with one of these unions The scope of the activities of the unions is, however, limited. The use of the machinery of the union for determining the range and character of its work and for examining its students does not absolve a school from submitting its own individual application to the Board of Education and the professional Institution concerned, since it must satisfy the conditions laid down as to premises, equipment, and staffing, as well as to the attainments of its students on their admission to the course. The co-operation of the regional unions has been of the

greatest possible value in the general development of the whole National Certificate scheme; indeed, it is difficult to see how, in some instances, full success could have been obtained without it.

There is no doubt about the excellent effect exercised on the provision and conduct of the education in technical schools in those branches in which the system of National Certificates has been applied. In the first place, the operation of the scheme has led to the introduction over a very wide area of curricula and syllabuses of instruction, which are acceptable to the great professional Institutions from the industrial, and to the Board of Education from the educational, points of view; and schools whose conditions were not altogether satisfactory have been induced to make improvements in the respects where deficiencies existed. Probably, however, the greatest benefits have been the creation of a system of examinations which has maintained national standards while allowing great freedom to the school as to the method of attaining them; and the introduction of a method of awarding certificates to students which is based not solely on their performances during the two or three evenings when they are being examined, but also on a proper consideration of the diligence, ability, and attainments of which they have given evidence throughout the whole of a course extending over two or more years. It is probable that the whole scheme is worthy of investigation by bodies responsible for the organization and carrying out of examinations in other branches of education.

It may be added that the functions performed respectively by the Board of Education and by the co-operating professional Institution are not the same; the functions of each are well defined and depend on their respective

opportunities for gaining a knowledge of the students and of what they are doing.

Both the Institution and the Board of Education are concerned to see that the scheme of instruction is sound; in this respect their interests are identical. The main aim of the Institution is, however, to see that the industry with which it is connected receives every year an adequate supply of young men with those qualities and that knowledge which are needed for its proper conduct. It is therefore interested both in the planning of the instruction and in the nature of the tests applied to the students at the end of their course The Board are interested to ensure that the scheme of instruction can be carried out efficiently and economically in schools, and that it pays due regard to educational, as well as industrial, considerations

The Board are not concerned with individual students, but only with groups of students; all that they testify in a certificate is that the group of students to which the candidate is said to belong has been taught under suitable conditions, of which the Board have gained knowledge through their Inspectors. The Institution is concerned with individuals, about whose behaviour in the examination tests they have gained knowledge through the assessors whom they have appointed for the purpose.

This distinction between the tasks undertaken by the two co-operating bodies is quite clear. It is of importance that it should be drawn, since its realization is of value when difficult questions of administration come up in connexion with any particular scheme.

In spite of the utility of the scheme, it is probably not capable of any considerable extension, since it demands the co-operation of Institutions which were

founded, and are carried on, for an entirely different purpose, namely, that of establishing and maintaining professional standards of knowledge and conduct among the higher officers of particular industries If the undertaking of this co-operation made such demands on the activities of the Institutions as to interfere with this primary purpose, they would certainly be unwilling to enter upon it. It happens that there are in existence a number of professional Institutions of high standing, interested in technical education, in which the work involved by their co-operation with the Board of Education is small in comparison with their main task, though it would be wrong to say that they regard it as trivial. It can, however, be undertaken without any serious interference with their main objects. This, and the fact that all of them are anxious to do everything in their power to secure the proper training of recruits entering their industry who gain knowledge through concurrent work and study, has induced them to co-operate willingly and effectively in the several schemes for the award of National Certificates to students in technical schools.

CHAPTER IX

THE JUNIOR TECHNICAL SCHOOL

ITS ORIGIN AND DEVELOPMENT

REFERENCE has been made earlier to the fact that a number of School Boards carried on secondary schools before the Education Act of 1902, creating Local Education Authorities and endowing them with far wider powers, brought their existence to an end. These schools, which were known as Organized Science Schools, were aided by grants from the Science and Art Department and had consequently a curriculum which was predominantly scientific in character for all pupils; this was indeed the only justification for their receiving aid from a Department which existed for the purpose of encouraging instruction in science and art. For a proportion of the pupils in attendance this curriculum was no doubt quite suitable, since it was adapted to their abilities and their ambitions; but for others, who had no great taste for the study of science and no desire to enter an occupation where a knowledge of science was of great importance, the curriculum of the organized science school was ill-balanced and therefore unsuitable. The school was, in fact, a kind of makeshift, which arose out of a temporary set of conditions; it was neither a good secondary school nor a good trade school, though it had some of the features of both.

With the coming into operation of the Education Act of 1902 most of the organized science schools became secondary schools, which developed into the type which is now usual in England. They had, however, been of use in their day to a certain limited class of pupils, and accordingly it is not surprising that the

Board of Education included in their Regulations for Technical Schools in 1905 a clause (Section 42) enabling technical schools to receive aid for 'Day Technical Classes' attended by pupils who had completed their elementary education. This step on the part of the Board was very cautious; it was their intention to devote nearly the whole of the available energies of the Department to encouraging the newly formed Local Education Authorities to create a system of secondary education which should be adequate for the needs of every part of the country. There was the additional circumstance that the improvement of the teaching of drawing in the elementary schools and the introduction of practical subjects, such as cookery, woodwork, and metal-work, into the curricula of both elementary and secondary schools rendered the need for day technical classes of the kind contemplated in Section 42 of their Regulations less necessary than it had been before the new era which began in 1902. It is certain, however, that neither the elementary school, with its addition of more practical subjects, nor the secondary school, with its emphasis on the postponement of specialization until a sound foundation of general education had been laid, fulfilled all the needs. There were potential pupils willing to remain at school for a year or two beyond the statutory leaving age, for whom the general education of the secondary school was not completely adapted. It was for this reason that the decision of the Board to aid day technical classes by grants was welcomed Within a short time as many as fifteen schools in the north of England had established classes of this kind, all of them receiving full-time pupils, though there were in addition detached classes under the same Regulations. The movement for the

establishment of Junior technical schools—as the full-time classes for ex-elementary school pupils came to be called—was particularly rapid in London, partly because of the concentration of its population and the consequent existence of large aggregations of persons in suitable industries, and partly because of the comparatively limited opportunities afforded by the conditions of employment in London for the training of young persons wishing to enter skilled employment. By the year 1912 there were 111 institutions conducting, under Section 42 of the Regulations for Technical Schools, day technical classes spread over 324 courses of instruction. Not all of these were of the Junior technical school type, but the number of this type was sufficient to cause the Board of Education 'to note with satisfaction' the development of full-time day schools attended by pupils free from the obligation to attend school. They therefore decided to recognize these schools under a special set of Regulations and to pay grants to them 'to a degree more commensurate with their importance'. This step was due; the Junior technical schools had justified their place in the educational system of the nation, and formal recognition could be granted to them without any risk that any interference would be caused thereby to the proper growth of the system of secondary education, by this time firmly established on a sound foundation. The increase in the number of Junior technical schools since 1913, when they first received separate recognition, has been steady, if not rapid. By the end of 1913–14 there were 27 schools for boys and 10 for girls; by 1920 there were 67 for boys and 13 for girls; and by 1930–1 there were 110 for boys and 34 for girls. There were also 33 schools for both boys and girls by 1930–1.

THE TWO TYPES OF SCHOOL

It has been found administratively convenient, both by the Board of Education and by Local Education Authorities, to group together two essentially different types of school.

(*a*) *The pre-apprenticeship school*, which receives pupils between 13 and 14 years of age, who have decided that they are likely to enter a particular kind of industrial work, but not a specified occupation within an industry, and are being prepared to enter it at about the age of 16. This is the normal—and in the provinces almost the only type—of Junior technical school.

(*b*) *The Trade School*, which substitutes a training in the school for apprenticeship in the workshop. Unlike the normal Junior technical school, it prepares its pupils for a defined occupation, for example, bookbinding, silversmith's work, certain building crafts, and the needle trades. The trade school is found only very rarely outside London, but is carried on very successfully there.

The trade school undoubtedly owes much in its origin to the *écoles d'apprentissage* of France, but the usual form of Junior technical school is entirely English in conception and in method. It differs fundamentally from its foreign analogues in being regarded as part of the educational system of the country, whereas the continental *écoles professionnelles* (which have some features in common with it) may more fitly be regarded as part of the industrial system. In essence the English trade school, which in fact provides an apprenticeship under somewhat artificial conditions, ought to be classed as falling within the industrial system rather than the educational

system of the country. It is a fortunate circumstance that its conditions are so similar to those of the Junior technical school that the two types can be treated, illogically but conveniently and profitably, as a single type, since this ensures that the pupils of the trade school will, during the impressionable years between 14 and 16, be under educational influences of a very favourable kind.

THE NORMAL JUNIOR TECHNICAL SCHOOL

As a rule, the pupils in this type of Junior technical school are preparing to enter the constructive industries of engineering or building. No attempt is made, however, to provide specially for the needs of either of these industries, still less to provide for the needs of those intending to enter any particular craft within one of them. For this reason the curriculum aims at continuing the general education received in the elementary school, and for some of the pupils, at any rate, the instruction is almost wholly an extension of the subjects to which they have already devoted considerable attention. The relative amounts of time devoted to these subjects, and their method of treatment, are, however, different, so that the curriculum invariably has a strong bias, although it is not vocational in a very narrow sense.

The pupil has already gained some knowledge of history, geography, English, and mathematics in the elementary school, he continues the study of these subjects in the Junior technical school, but finds that he has to devote about as much time to mathematics as he does to the other three subjects combined. He has probably learned a little of the science of common

life by listening to oral lessons dealing with such matters as the properties of air and water; now he works in a laboratory, and does experiments for himself in order to learn something of heat, of electricity, and of mechanics. He may have acquired some skill in the working of wood by spending two hours or so every week in the school workshop and using hand tools; he now gains greater skill and learns more of the working properties of wood and of iron by using hand and simple machine tools in a more elaborately equipped workshop, in which he spends five or six hours a week. He has already practised freehand drawing and possibly knows something of geometry; he now devotes five or six hours a week to adding to his knowledge of geometry and to acquiring such familiarity with the principles of geometrical projection that he can readily represent any simple machine part or building detail in the conventional way used in the constructive industries, and begins to be able easily to 'read a drawing'.

In the continental schools carried on for pupils intending to enter the constructive trades, it is usual for the workshop to be the centre of the instruction; and around this, and connected with it, is the instruction in other subjects. This is not so in the normal English Junior technical school, which sets before it clearly and definitely the aim of continuing the general education of its pupils and maintaining such a balance in the curriculum that this aim is preserved without loss. At the same time it treats the various constituents of the curriculum in such a way that the pupil on leaving school is able readily to take his place, with comfort to himself and satisfaction to his employers, in the workshop, and also, if he is ambitious, to undertake the specialized study of the problems of

either the engineering or the building industry. The accomplishment of the aim of this type of Junior technical school is only possible from the fact that the teachers engaged in them include in every instance well-trained men, with experience of one or other of the industries for which the school prepares and a good deal of interest and zeal in the proper conduct of the school. No one who visits one of these schools can fail to be impressed by the atmosphere of interest and industry which permeates it; and it is very satisfactory to be able to record that the Committee set up by the Board of Education in 1929 to investigate 'Education for Engineering' expressed their high appreciation of the Junior technical school.

THE TRADE SCHOOL

Since most of the English trade schools preparing their pupils for employment in a single occupation—usually a skilled craft—have been established in London, they are not so numerous as are the normal Junior technical schools. In character they resemble more closely the continental trade schools. Like the other Junior technical schools, they aim at continuing the general education of their pupils, and have considerable success in this respect; but they differ from the normal Junior technical schools in that they, like their analogues on the Continent, regard the workshop as the centre of the instruction. A large proportion of the school week—sometimes as much as two-thirds of the total time—is spent in doing trade work, and the opportunities for continuing the general education of the pupils are thus somewhat limited.

In the schools which train pupils for the trades with a strong artistic element—for example, silversmith's

work, cabinet-making, photography, or the needle trades—a good deal of time is spent in the Art room; this is usually a place of great interest, since the work is planned very carefully so as to be successful in giving considerable skill in drawing and in the choice and use of colour, while at the same time having special reference to the varying needs of the different groups of pupils. The trade schools of London are fortunate in being within easy access of the national art galleries and museums, of which they make excellent use.

In addition to the trade schools for the industries with an artistic side, there are others which give instruction in the building crafts, this being very necessary in London, where the proportion of apprentices in the building trades is far less than it is in the country as a whole.

One of the difficulties experienced everywhere is that of approximating the conditions of the trade school to those existing in industry. If such a school falls far short of reproducing the atmosphere of the trade workshop, it fails to give a real apprenticeship to its pupils, and this, after all, is the object it has set out to accomplish. In most countries the hours of instruction in a trade school are longer than those in a school of general education. In England they are usually about 30 each week, but on the Continent they are much more; during a visit to the trade schools of Holland, Belgium, France, and Czechoslovakia, the shortest school week ($38\frac{1}{2}$ hours) was found in Holland, while in other countries it was usually not less than 44, and in two instances it was as many as 54.

Another method of imparting reality to the atmosphere consists of making goods for use and selling them. This has the advantage that the finished articles

must show a definite standard of workmanship and comply with trade requirements. In England, since the schools are few and rather small, no difficulty arises in disposing of them. In Holland, where trade schools are more numerous, it is the practice to organize raffles in some schools at intervals in order to turn the finished goods into money. In France, Belgium, and Czechoslovakia goods are made for use in public institutions; one school in Belgium, for example, makes and sells to other schools apparatus for use in mechanical and physical laboratories, while another school—in France—makes furniture which is used in central and local government offices. In Czechoslovakia, where there is a large number of trade schools, it is not unusual for practically the whole of the furniture and equipment of the room of the Principal of a school of this type to have been made in other schools, while the Central Department of Education at Prague has a large conference room equipped in this way.

Still another method employed for imparting reality to the atmosphere of the trade school is that of training the pupil to time and cost each of the tasks he executes in the workshop; this plan is adopted very generally in the French trade schools.

BUILDINGS AND EQUIPMENT OF JUNIOR TECHNICAL SCHOOLS

Since some of the present Junior technical schools started as 'Day Technical Classes' when the Board of Education decided in 1905 to grant aid to this type of instruction, they have continued to be carried on in the premises of technical schools originally established for other purposes, especially that of providing instruc-

tion for part-time students; examples of these are the Junior technical schools conducted in the premises of the Halifax Technical College and the Salford Royal Technical College. At a later date, when independent recognition was given to this type of full-time education by the Board of Education, some of them were started, like their predecessors, in the premises of existing technical schools. Others, however, were installed in premises of their own, though these had almost invariably been erected for other purposes; indeed, until recently there was only one Junior technical school in the country which was carried on in buildings specially designed and built for the purpose. The Junior technical schools in Leeds, for example, are in buildings originally used as Mechanics' Institutes; that at Barrett Street, London, is carried on in the premises of an old elementary school, though considerable modifications and additions to it have been made; and that carried on by the London Education Authority at Queen Square, Bloomsbury, is housed in a building which was originally a private house. In spite of the differing history of all these buildings, they are usually fairly well adapted for their special function.

It is customary for a Junior technical school which is set up independently of an evening technical school to add to its ordinary activities the holding of evening classes, either in the same subjects as those taught during the day time, or in subjects closely related to them. At first sight it might appear that there is little difference between an institution which begins as an evening technical school and adds on a Junior technical school, and one which, beginning as a Junior technical school, proceeds to start evening classes. There is, however, the difference that in the former case the

Junior technical school is only one department of a greater institution, its Head Master being the head of that department and subordinate to the Principal of the whole institution, while, in the latter case, the Junior technical school is an independent unit, whose Head Master is Principal of the whole school; this difference is very important, and is indeed fundamental, since it affects the whole outlook of the staff

In recent years, it has happily been found quite feasible nearly everywhere to provide opportunities for playing outdoor games for Junior technical school pupils, and to make them part of the ordinary activities of the school.

As regards the equipment, it is usually quite adequate for the purposes. In some instances—for example, the L.C.C School of Photo-engraving—it is necessarily elaborate; but in others—for example, the schools for the needle trades—it is simple. In the provincial schools, where the pupils are, as a rule, preparing for entrance to the constructive industries, the use of the equipment is shared between the full-time pupils of the Junior technical school and the part-time students following the earlier years of the courses in building or engineering subjects.

THE ENTRANCE AGE TO THE JUNIOR TECHNICAL SCHOOL

When the first schools of the Junior technical school type were established under the Regulations for 'Day Technical Classes', only those pupils were eligible for admission who were free from the obligation to attend school, that is, the minimum age of entrance was 13. In 1913, when the schools were recognized under their own set of Regulations, it was contemplated that the normal age of admission would remain the same, but

provision was made for pupils to enter at the age of 12. That this admission at a lower age was regarded as exceptional is indicated by the fact that the grant payable on their attendances was at the rate of £3, instead of £5 per pupil which was paid on account of those admitted at the age of 13 or more. It is probable that, even in 1913, when the schools were developing, it was felt that there was something to be said for the plan adopted later of permitting pupils to enter the Junior technical school shortly before the age at which they would normally leave the elementary school.

Under the 1913 Regulations the curriculum was to cover two years, so that pupils would leave between the ages of 15 and 16, the usual age at which boys were apprenticed—or began to learn skilled work—in the industries with which the schools were connected.

At the present time, Junior technical schools are carried on in 102 separate schools, the number of courses recognized being 177 in all.[1] The number of these courses which admit pupils under 13 years of age is 32, that is, about 18 per cent. of the total number; of these some have an entrance age of 12, some $12\frac{1}{2}$, and a small number of $12\frac{3}{4}$. It is significant that in all but two cases (at Radcliffe and Bury Technical Schools) the lower age of entry is associated with an extension of the course to three years. Indeed, it would be difficult for a school which had a very large proportion of its pupils entering upon a two years' course at the age of 12, and accordingly leaving at the age of 14, to put forward any convincing claim to be regarded as a place of higher education; and the Junior technical school is so regarded for administrative purposes.

[1] Of these, 42 are Junior commercial schools, which are dealt with in a later chapter.

With the reorganization of the national system of education during the last few years, and the elaboration of the means for transferring selected children to secondary and central schools soon after they arrive at the age of 11, there has arisen a suggestion that the age of admission to Junior technical schools should be lowered to 11, so that the same examination test might be applied to all children in elementary schools. This plan would enable the Authorities to distribute at the same time all the selected children amongst the various types of 'post-primary' schools. It would undoubtedly be simple and easy of administration; and if this were the only factor to be considered, there is no doubt it should be adopted, especially as this would enable the Education Authority to avoid the very real danger that the secondary school, through having the first choice at 11, may select all the best and most suitable pupils and leave a second-rate residue for the second selection of pupils at 13 for admission to the Junior technical school. But neat administration is not necessarily good administration; and there are very grave objections to selecting children at the age of 11 for admission to a technical school of any kind, since their admission to such a school would imply that they had decided upon their future career at that tender age, and were indeed embarking upon it. The Junior technical school, even of the ordinary provincial type, has the definite intention of preparing its pupils for work in certain industries; the trade school aims at even a narrower task, that of preparing its pupils for work in a specified occupation; and it is not fitting that a child of 11 should be required to enter upon either of these kinds of preparation.

Pascal spoke of 'Le choix du métier' as 'la chose la plus importante de toute la vie...', and there is no doubt

of the truth of this description. The choice of a career should therefore be postponed to the latest possible moment. There is thus a quite insuperable obstacle to lowering the age of admission to a Junior technical school below 13 or 14. A report issued in 1930 by the Board of Education discusses this very important point and indicates how the difficulty of having two ages of selection, one of them two years later than the other, can be minimized. It states:

'It has been found that if parents and teachers are kept properly informed, and if no artificial barriers are placed in the way of transfer, the Junior technical school has no difficulty in securing its quota of suitably gifted pupils. In some areas there are selective central schools which regularly send a proportion of their more gifted pupils on to the Junior technical school, a similar arrangement in secondary schools is not unknown.'

It is indeed important that there shall be the greatest possible freedom of transfer from one type of school to another at about the age of 13, so that pupils incorrectly placed, either because of the selection being unsuitable or through other circumstances, may receive the sort of education by which they are best fitted to benefit, and the kind of training which is most likely to enable them to enter upon a congenial and worthy way of life.

It is sometimes suggested that the problem we have been discussing might be solved by making a kind of composite school with a four years' course starting at 11, the first two years to be general, and the second two years to be specialized. Such a school would have, in fact, two distinct aims, of which one would be vocationally undefined, and the other very exactly defined; but a school should be one community and not two, and there

is no doubt that the existence of these separate and different aims would tend to split the community into two separate halves. This constitutes in itself a very strong objection to the proposal. There are, however, other objections to it; there would be difficulties of staffing, since the teachers of the upper part would bring into it an industrial atmosphere, which would be to the disadvantage of the lower part; or the converse might happen. Further, the furniture and equipment of the technical school in which so many of the Junior technical schools are carried on are unsuitable for small children. Finally, there is the risk that a technical school, which is by its very nature a place of instruction for persons who have made up their minds that they will enter this or that occupation or industry, and are necessarily of a certain age and maturity, would suffer in prestige and consequently in influence if it were used for the purpose of teaching young children. On the whole, therefore, it is undesirable that any attempts, even of an experimental kind, should be made to establish schools of this composite character. The existing schools, with their present age-range, are so successful that there is no real need to try experiments which have so little to be said for them, especially when these would have to be made at the risk of diminishing the value of the training given to the pupils on whom the experiments were carried out.

OTHER CONDITIONS OF ENTRANCE

With an increasing realization of the value of the training given in Junior technical schools to boys and girls who have decided upon their future occupation, there has arisen in many towns a certain amount of

competition for entrance to the schools. Accordingly, it is usual for the Authorities to hold an examination amongst the candidates for admission and to admit only those who are highest on the pass list. This has the natural result that the standard of the work done in the school is gradually raised year by year until it is equivalent to that done in secondary schools by pupils of the same age-range. The Junior technical school in fact becomes better and better. In this capacity for improving the standard of the work, satisfactory as it is from one point of view, there is involved a risk that the boy or girl of average ability—and most of the work of the world is done by persons of ordinary ability and attainments—will not have the opportunity of receiving the kind of education which the Junior technical school was originally intended to provide. There is much to be said, at any rate in some places and in some circumstances, for replacing the competitive examination for entrance by an examination which aims only at ascertaining whether the pupils are qualified to benefit by the instruction given and not at selecting only those of outstanding ability. This plan is adopted with success in the trade schools carried on in Paris by the Chamber of Commerce there.

RELATIONS OF THE SCHOOL WITH INDUSTRY

One of the most satisfactory features of the Junior technical school is their close and cordial co-operation with industry, which is practically universal throughout the areas where they have been set up. This co-operation usually exists from the start, for it is the custom of Education Authorities, when contemplating the opening of a Junior technical school, to inquire

amongst the various employers in the industries concerned as to the prospects of their including amongst their recruits a sufficient number of pupils who have passed through the course of instruction successfully. It is only when the replies to these inquiries are satisfactory that the school is opened. It was calculated many years ago that a catchment-area with a population of about 30,000 is the smallest in which a Junior technical school can be started with prospects of success. This estimate is probably not far wrong, since it is unlikely that a smaller area could absorb into the trades for which the school prepares the twenty-five pupils or so who are turned out annually by the smallest school of this type which can be carried on with proper regard to economy. Naturally, a town which is almost wholly given up to engineering—such, for example, as some of the railway towns—can carry on a Junior technical school with success and economy, even if its population is somewhat less than that stated.

After a Junior technical school has been in existence for some time, it is an effective agency for placing its pupils at the end of their course. The Principal is invariably in close touch with local employers in the industries for which the school prepares; they come to him for their recruits and put a good deal of trust in his recommendations. The great care exercised in consulting industry before establishing a school, and the use of the school as an agency for placing, lead to the very rapid absorption of the pupils who finish the course satisfactorily; it is usual for most of them to be placed within a few weeks after the end of the school year.

This method of placing boys and girls in employment obviates entirely the need for holding any kind

of standardized leaving examination, or for issuing a certificate to be presented by the pupils to a prospective employer. This is a great advantage, since it enables the school to plan its work in the way it thinks best suited for giving a thorough preparation for the careers which its pupils have elected to enter. If any employer wishes to have visible confirmation of the recommendation of the Principal of a Junior technical school, the best testimony is furnished by the note-books and practical exercises worked by the pupil, which are available for his inspection.

THE SIZE AND COST OF JUNIOR TECHNICAL SCHOOLS

The Report of the Board of Education to which reference has already been made points out that the existing technical schools are nearly always small; on an average, each school has less than 150 pupils, while a number have less than a hundred. The main reason for the small size of the schools is given in the preceding section, that is, the care that is taken to adjust the output of the schools in accordance with the prospects of employment.

The cost of this type of school is relatively high. This is due mainly to the fact that so much of the work is done in laboratories, work-rooms, and drawing-offices, and consequently the classes are small. An additional reason, not, however, so important, is that the school sometimes has expensive equipment and uses a fair amount of expensive materials.

THE POSSIBILITY OF ESTABLISHING JUNIOR TECHNICAL SCHOOLS FOR OTHER INDUSTRIES

Since the Junior technical school is, by common consent, excellently adapted to prepare young people

for entrance to the constructive industries of engineering and building, while the trade school is equally suitable for the needs of those desiring to enter certain crafts, it is natural to ask why, during the twenty years of the existence of this type of school, no Education Authority has ever extended the provision of schools of the normal type to other great industries, and why practically no provincial Authority has created a trade school. These are separate questions, which have been dealt with in Chapter VII (p. 69 *et seq*), but it may be added here with respect to the first, that the Junior technical school, being, as it is, a path laid down between the elementary school and employment, must be direct and safe. It does, as we have seen, issue directly from the elementary school; and it leads safely and directly to useful employment in certain industries. But in industries, such as textiles, where the general age of recruitment is 14, there is no visible continuation within the works of the longer approach to employment which the Junior technical school constitutes. This, in itself, is a serious obstacle to the establishment of schools of this kind for preparing boys for entrance to these industries.

Another reason is the comparatively incomplete stage of development of technical education for certain industries, a matter which has already been discussed in Chapter VII. It is obvious that if an industry has emerged from the handicraft stage without having yet attained to the scientific stage there will not be any very clear definition of the scope of the work of a Junior technical school preparing its recruits; this scope will be subject to variation as the practice of the industry develops.

THE ATMOSPHERE OF THE SCHOOLS

This chapter on the English Junior technical school, which, although a small element in the national system, plays within it such an important part, may close fittingly with an extract from the Report of the Board of Education which has already been quoted. The Report says:

'The Junior technical school is pervaded by an "atmosphere" readily perceived by the visitor but difficult to convey in words. The pupils attack their work with a seriousness and satisfaction not always found in schools for pupils of their age. They concentrate because they are interested, they are interested because they have no difficulty in realizing the direct bearing of their work on their future lives. They have the air of knowing exactly what they are doing, and why it is worth doing From the purely educational point of view, this is the most interesting and satisfactory feature of the work of these schools. If a cultural education means an education which cultivates to the fullest extent the latent powers of the pupil, so as to fit him to take his place, as a self-respecting citizen, in a community worthy of his membership, the unprejudiced visitor to the Junior technical school will admit that it is giving a more truly cultural education than many institutions which make greater pretensions in this respect. By setting up high standards of skill and accuracy, the school imparts to its pupils a strong sense of individual responsibility; by cultivating a pride in good craftsmanship, it lays a sure foundation for self-respect and respect of fellow workers; by appealing to the deep desire of adolescence for a definite place in the world of adults, it is able to awaken intellectual interests which persist and grow long after school days are over'

CHAPTER X

THE SENIOR FULL-TIME TECHNICAL SCHOOL

A. FULL-TIME COURSES OF INSTRUCTION

IN 1904, after the newly constituted Local Education Authorities had entered upon their work, the Board of Education included in their Regulations for Technical Schools a provision for aiding the 'organized instruction in science, or in science and art' of students who had received a prolonged general education. In accordance with the new regulation, grants were to be payable on account of the attendance at such courses of instruction of students who had either completed a three years' course in a recognized secondary school, or had reached the age of 16, and were qualified by their previous general education to benefit from them.

This step, together with that taken in the following year, when 'Day Technical Classes' intended for pupils of lower attainments became eligible for recognition by the Board of Education, was of great significance. It indicated that the Board had decided to introduce a classification of technical schools which should be dependent, not merely on the ambitions of individual students, but also on their educational antecedents. This classification was to apply, however, to only those schools which were carrying on day classes. The recognition of the Junior technical school—in succession to the day technical classes—as an independent type of school completed this classification in 1913. At the present time the Junior technical school, with its full-time course extending over two or three years from about the age of 13, is entirely post-elementary in

character, while the Senior full-time technical school, with its course of about the same length starting at about the age of 16, is almost entirely post-secondary in character. Both types of school are often carried on, of course, as independent organizations in the same premises.

The following particulars relating to Senior full-time courses have been extracted from the Annual Report of the Board of Education for 1931.

Senior Full-time Courses in Technical Colleges

Branch of Instruction	*No. of Students*	*No. of Courses*
Engineering	1,476	69
Arts (76), Preliminary (537), Science (379)	992	31
Pharmacy	659	38
Architecture and Building	615	10
Domestic	327	13
Chemistry and Chemical Trades	221	14
Mining	163	8
Printing and Photography	133	5
Textiles	116	14
Food and Drink Trades	116	5
Physical Training	103	2
Optics, technical	57	3
Leather Industries	51	2
Music Trades	41	1
Boot and Shoe Manufacture	20	3
Naval Architecture	5	1
Clothing Trades (2)	2	1
Miscellaneous	49	8
Totals	5,146	228

The figures relating to Senior full-time courses in commercial subjects are not included, as they are dealt with in the chapter on Commercial Education.

These figures, at first sight, are not impressive; they become less so when analysed for the purpose of seeing how far industry is recruiting youths of about 19 years of age who have spent two or three years in a full-time technical school after completing the course of a secondary school.

It may be assumed that the great majority of students following the courses in 'Arts, Preliminary subjects, and General Science' (992) are unlikely to enter industry; in a number of instances they are either preparing for a Matriculation examination, or are working for a university degree in a technical college because of its comparative cheapness. The students taking Domestic subjects (327) and Physical Training (103) are not preparing for industrial careers. Deducting 1,422—the total number of students following these non-industrial courses—from 5,146—the grand total of all those in Senior full-time courses—we find that the number of students following courses leading directly to employment in industrial or professional occupations is 3,724.

Looking now at the engineering group, we see that in 1931 there were 1,476 students following courses extending, as a rule, over three years, although a small proportion of them are completed in two years, while others have a duration of four years. The number of students turned out from the full-time courses in engineering is thus about 500 a year. It is of interest to compare this figure with that of the students completing the courses in the French *écoles d'arts et métiers*, which have just the same age-range; the six schools in France of this type have an annual output of 600 students in all. This comparison should not be made the basis of any far-reaching conclusions, since in England practically every modern university has a

school of engineering, while there are in France engineering schools other than the *écoles d'arts et métiers*. The character of the instruction in the English Technical College differs from that of the *écoles d'arts et métiers* in that it includes very little, if any, workshop instruction, whereas in the French schools the workshop is the central feature, round which every other part of the instruction is gathered.

Although the Report of the Board of Education does not indicate how many of the engineering courses prepare their students for university degrees, there is no doubt that a great deal of the work is based on the requirements of the university examinations and that many of the students take these. Some of the graduates devote themselves to teaching and other occupations where a knowledge of engineering science is of value, but it is probable that a large proportion, at any rate from the larger colleges, do enter the engineering industry in some capacity. The number of students following courses in chemistry is 221, a small number considering the importance of chemistry in many industries and the necessity of a sound academic training to the responsible officers in a chemical works. Its smallness is probably due to the fact that a large proportion of students who contemplate a career in the chemical industry obtain their training in university institutions, where the Honour Schools of Chemistry are usually large.

Considering now the remaining figures, we find that the total number of full-time students proposing to enter industry at about the age of 18 or 19 is 1,357, of whom 615—or nearly half—are following courses in Architecture and Building. The number of students following courses preparatory to the other 11 industries

named is 694, an average of 63 for each industry. When it is remembered that each course extends over two years, it is obvious that the industrial intake of youths of 18 or 19, with the kind of preparation afforded by attendance at a secondary school, succeeded by that provided in a technical college, and without any experience of industrial production or conditions, is very small It is clear that industry, as a whole, does not recognize the Senior full-time course as a suitable avenue to industrial employment. Exceptions to this are engineering, where academic studies preliminary to entrance to the industry have long been customary, and such branches as architecture, and baking and confectionery, where the conditions found in practice can be closely imitated in the school. It is often suggested that industries other than these are making a great mistake in adopting this attitude towards full-time preparation in schools, and that it would be of advantage to them to utilize more fully this type of educational provision. But this judgement cannot be accepted without careful examination of the facts. Individual industries and individual firms have to consider how the various posts can be filled with the greatest effectiveness. In the processes of manufacture within the works they need workmen, foremen, and works managers; in the designing rooms and the laboratories they may employ highly trained men of science or artists; in the office they must have a commercial staff, who are all the better for a knowledge—less detailed than that of the men in the works —of the processes of production. Into which of these groups does the youth of 18 or 19, trained entirely in schools with little or no practical experience, fit most suitably? If he goes into the works, he has to work

side by side with others of his own age who have been there for years, and are accustomed to its ways and its atmosphere; they may, like him, have been educated in a secondary school up to the age of 16, and have been afterwards diligent students in the part-time classes of a technical school. He has no real advantage over them, so far as knowledge is concerned, and may in fact be far less useful than they are; moreover, he enters the works as a potential competitor with them for any promotion that may be going.

If he enters the laboratories or the designing rooms he is in even worse case, since these are staffed to a great extent by university graduates, or at any rate by men of similar standing.

So far as the productive side of industry is concerned, there appear, broadly speaking, to be few openings for the youth whose training up to the age of 18 or 19 has been wholly in schools. He knows less of the practical side of the business than a boy who has entered it direct from a secondary school at the age of about 16, and he is less mature than a university graduate who has entered it at the age of 21 or 22.

On the commercial side of industry there are, however, possibilities of developing the employment of young men who have had a Senior full-time course in a technical college, since actual workshop experience is not usually an essential part of the training for it, and at 19 considerable adaptability is not unusual; but openings of this kind are few in number, since there is no reason why an employer should not select for filling them young men who have shown, by their work on the manufacturing side, that they possess the qualities needed for success in commerce.

Generally speaking, therefore, there appears to be

little likelihood of any great and immediate increase in the number of students following Senior full-time courses in technical colleges.

Before leaving the subject of Senior full-time courses, it should be mentioned that there are a small number of such courses carried on as 'Day Technical Classes' with less rigid conditions of entrance; the number of industrial students in attendance is, however, negligible.

B. SENIOR PART-TIME CLASSES HELD DURING THE DAY-TIME

The comparative failure of the Senior full-time courses to attract students other than those looking forward to a career in engineering does not point to an absence of belief in the value of technical education amongst industrialists. What it does show is that industry generally regards trade experience as an essential constituent of a complete training, and considers that this experience should be concurrent with school instruction As we have seen earlier, most of the school instruction is given in the evenings of the winter months, but there is also a certain amount of it during the day-time for students who are permitted by their employers to have one or two half-days absence from work each week for this purpose. The total amount of this instruction is far less than is desirable, but nevertheless its volume exceeds that of the full-time study unassociated with workshop training.

This part-time instruction takes more than one form. It is, for example, customary in technical colleges to admit part-time students to certain classes which are constituents of the full-time courses. In addition to this arrangement, special classes for part-time students are

opened in many schools during the day-time. Particulars of the numbers of students in attendance at both these types of instruction during the session 1931–2 are given in the following Table.

Male Part-time Students attending during the Day-time.

Branch of Instruction	*In Senior Full-Time Courses*	*In Day Technical Classes*	*Total*
Engineering	362	6,606	6,968
Printing and Photography	77	2,288	2,365
Architecture and Building	30	1,800	1,830
Pharmacy	174	967	1,141
Chemistry and Chemical Trades	223	384	607
Textiles	137	388	525
Mining	9	460	469
Mathematics		375	375
Food and Drink Trades	1	366	367
General Industrial	13	319	332
Optics, technical	11	112	123
Carriage and Motor Body Building		109	109
Music Trades		107	107
Boot and Shoe Manufacture	16	61	77
Clothing Trades	28	11	39
Rubber Trades		23	23
Miscellaneous	3	302	305
Totals	1,084	14,678	15,762

In addition to these, there are students who take short full-time courses, extending over about 300 hours on an average; but when the nautical students, who attend for short continuous periods between voyages, and the young women taking domestic courses are left out of account, the numbers are inconsiderable. It should be stated that only the male students attending day technical classes are included in the table, since, although a good many girls and women attend them,

they are usually studying either pharmacy, domestic subjects, or matters related to the clothing trades.

An examination of the Table shows that those students who take subjects selected from the full-time curricula form a comparatively small proportion of the total, that is, about 7 per cent. It is usual to make special arrangements for the students who can attend for part of their time only, as they are so much more numerous than the others.

In this Table, as in that showing the prevalence of full-time instruction for the different industries, Engineering is at the head of the list, with 6,968 students; Printing and Photography come second, with 2,365; and Architecture and Building are third with 1,830 students. These three industries alone account for 11,163 day students, or over 70 per cent. of the total. This is very significant, when it is taken into consideration that by far the majority of the students attending part-time day classes do so in normal working hours. It is obvious that the employers in the engineering, printing, and building industries are much more ready to set free their younger employees in order that they may attend school than are those in the other great industries.

This system of release from employment on one or two half-days a week is not new. It started many years ago by the establishment of works schools held by employers in their own premises, and at a later time, when full-time courses were set up in technical schools, it developed into a system of sending selected apprentices to share in this instruction. Amongst the employers who adopted the practice at a very early date were the railway companies and the Admiralty; this Government department founded the Dockyard

schools, which have been carried on with such remarkable success, as long ago as 1843. Woolwich Arsenal has for many years allowed its apprentices 'time off' for the purpose of attending school, but arranges that they shall attend the classes organized at the Woolwich Polytechnic, and not at classes carried on by the War Office itself.

The growth of these arrangements for encouraging technical education amongst young employees by granting them the privilege of day-time instruction is recent, much of it having taken place since the War. It is due, partly, to the establishment by large firms of welfare schemes and the appointment, especially by engineering firms, of apprentice-superintendents and similar officials, who in many instances have been able to act as liaison officers between the works and the school. The discussion of the compulsory day continuation school provisions of the Education Act of 1918 had also an effect in calling public attention to the importance of allowing 'time off' for the purposes of study.

It may be assumed that employers generally are well disposed towards technical education for their industry, but to make arrangements for allowing young employees to absent themselves from work demands more than vague goodwill; it demands action, and this is not always easy. In some industries a youth may be engaged as a member of a group of workers, and his absence may disorganize the work of the whole group; or he may be engaged on piece-work, or responsible for the working of a machine which cannot be allowed to stand idle; and there are other difficulties, which are special to each occupation. Where apprentice-superintendents are engaged, these difficulties can be minimized, if not entirely overcome.

The increase in the number of young engineers attending part-time day classes in recent years has been considerable; there were 4,178 such students in 1927–8, and 6,968 in 1930–1. It is of interest to note, too, that the movement has spread to some of the small towns, and is not confined to those centres with a large engineering population; the town of Stroud, for example, has over 40 apprentices in attendance at its day classes. So widespread is the movement that over 40 per cent. of the schools approved for the award of National Certificates in Mechanical Engineering have part-time attendance during the day-time as part of the courses leading up to the National Certificate.

A very large proportion of those set free to attend school by employers in the printing industry are in London, where practically all apprentices to its different branches receive this privilege. The employers exhibit a very active interest in the schools for printing, and indeed make large contributions towards the L.C.C. School of Printing Attendance is usually for one half-day each week.

The development of part-time day classes for building employees is of more recent growth than that in either engineering or printing. One of the excellent features of these classes is that they are frequented not only by learners from the larger firms but also from firms of quite small dimensions.

In spite of the success of the system of 'time off' in the three industries mentioned specially, it is a matter for regret that, on the whole, the total number of part-time day students is not increasing. At the present time this is probably due to bad trade, which prevents firms from adding to their responsibilities even the slight burden imposed by permitting a small number

of their apprentices to absent themselves; it must be taken into account, too, that the granting of 'time off' is rarely accompanied by the deduction of pay, though in some instances this deduction is made.

If the system is extended, every employer who adopts it will have to consider whether he shall set free all those aiming at becoming skilled workers, or only selected apprentices, the basis of selection being good workshop records, or such records accompanied by evidence of diligent study in the evening classes of the technical school. Both these methods are adopted by employers.

Another matter for decision is the relation which is to exist between day and evening attendance. In some instances, students set free to attend school during the day are compelled by their employer to attend evening classes as well; in others, they are not. Where there are proper facilities, there is much to be said for insisting on at least one evening's attendance a week at the technical school. The employer has put himself to a certain amount of inconvenience on behalf of the apprentice he has released, and it is not asking too much of the apprentice that he, for his part, shall show his recognition of this by giving up some of his own time.

CHAPTER XI

EDUCATION FOR COMMERCE

SOME GENERAL CONSIDERATIONS

IN a report on 'Commercial Education' presented to the Associated Chamber of Commerce in 1887, it was stated that while 'technical education in the sciences which underlie all arts and industries is being provided in the chief centres, no attempt has been made to supply a technical mercantile education. This for the greatest mercantile nation of the world is a singular fact. It is a most serious defect in our educational system, and one that calls loudly for amendment and reform.' It is still true, nearly fifty years later, that our system of commercial education needs improvement.

We have an organized system of education for engineers, builders, miners, textile workers, and others engaged in industrial production; and, in spite of the defects in this system, it is working satisfactorily within the limits imposed upon it by its circumstances and its history. Technical education includes, however, not only the training of persons engaged in the manufacture of saleable and usable goods. It includes also the training of that very numerous body of persons engaged, directly or indirectly, in the sale, transport, and distribution of the goods when made; and, except for certain workers included in that body, comparatively little training is as yet being provided in schools.

There are several reasons for this state of things. The first is that, until a few years ago, England was a very prosperous country, notwithstanding the grave deficiencies in her educational system. There was thus no strong, insistent force, impelling those engaged in

trading to consider how they should improve the efficiency of their personnel, and indeed their own efficiency. But conditions have changed, and it has become necessary to employ well-considered and quite definite means to ensure that British trade and commerce shall have available at all times an adequate supply of men, able to cope with the commercial problems of these more difficult times.

A second reason is that the successful conduct of business demands in its responsible officers certain personal qualities, which are of even greater importance than is specialized knowledge. These include industry, honesty, resourcefulness, self-reliance, imagination, and the ability to form swift and accurate judgements of men. In general, the English system of education has always tended to produce men with these qualities, and accordingly there has not hitherto been the same need for specialized commercial education as would have existed otherwise. The problem before us is that of maintaining these qualities, and at the same time giving greater knowledge and a wider outlook to those on whom the responsibility rests for the future conduct of business.

A third reason for the lack of attention to education for commerce is the fact that until a few years ago the individual business was smaller than it is now. For this reason it was possible for a young man to enter a smallish business and, in time, to learn a good deal about most of its activities; but in these latter days, and especially since the War, there have been great amalgamations of firms. We can readily recall instances of such amalgamations—for the manufacture and sale of chemicals, tobacco, drapery goods, cotton yarns and thread, soap, and many other goods. Such great

combines of firms as these are usually highly 'departmentalized', and it has become more difficult for a young man, unless he either enters the firm in a privileged position or shows himself worthy of being granted special privileges, to gain anything like a complete knowledge of many departments.

Still another reason is the fact that the competition of other countries has become keener; before the War there were overseas markets in which our goods sold readily. In the changed circumstances, the training which sufficed to sell goods in these markets at that time is not now adequate.

All these factors have to be taken into account in the consideration of the future of commercial education.

The problem of devising a system which is satisfactory is difficult and complex. Commercial education is, in fact, not a single branch of education like, say, engineering education; it is not a great exaggeration to say that it is possibly nearly as complicated as the whole of industrial education, and covers as many types and grades of workers.

THE COMMERCIAL ACTIVITIES OF A GREAT TOWN

The complexity of the problem may be illustrated by considering the commercial activities of a single great town, such, for example, as Bradford. Bradford is the most important wool-working town in the world. It buys in London (or elsewhere) raw wool brought from Australia, New Zealand, and other countries, and it sells finished cloth in every civilized country in the world; but between the wool buyer, who may be engaged in the earlier processes, and the merchant, who sells the finished cloth, there are also the spinner,

the manufacturer, the dyer, and the finisher. These producers may, or may not, constitute one great firm. If they do not, some of them will actually buy the materials on which they work, while others will be doing work on commission It is clear that all of them are engaged in trading, and hence that they need commercial knowledge.

Bradford is, however, something more than a collection of large worsted factories. The wool-working industry collects round it other industries necessary to it —engineering, for example, for the factories are full of machinery, which must first of all be manufactured, and then maintained.

There are also the needs of the population to be met, for the men and women engaged in the industrial activities of the town must be housed, fed, clothed, transported from place to place, educated, and amused; and in all a very large number of persons are engaged in supplying these varied needs. Some of them are producing goods, while others are carrying on the services of organization, and of supply, transport, and distribution. Here again, it is obvious that many of these persons need commercial knowledge just as much as those who are occupied in the primary wool-working activities of the district.

Side by side with all these multifarious functions are the ancillary functions of banking, insurance, law, accountancy, and transport, without which the business of a great community with world-wide interests and connexions, based on a few square miles of Yorkshire, could not be carried on.

When it is taken into consideration that the country as a whole contains many such towns as Bradford, all of them with activities just as intense, it cannot be

doubted that the efficient training of all the persons engaged in commercial pursuits presents a problem which cannot be regarded as simple.

It is not suggested that every person engaged in a commercial occupation needs specialized education in a school in order to be able to do his work effectively; indeed, the value of school instruction is often overestimated. But practically every commercial worker needs some kind of guided experience in his job, while some of them can benefit by adding to that experience systematic study under the guidance of a teacher.

A little consideration shows that amongst commercial workers there are, even in a single great town, hundreds of different types of workers, each type with educational needs differing more or less from those of other types. The first problem before the commercial school in such a community is to find how all these types can best be divided into homogeneous groups for educational purposes; for the school can only deal economically with groups of students, and these must be fairly homogeneous and of reasonable size. The organizer of commercial education in a great community has therefore a formidable task in front of him.

One of the first and most obvious divisions amongst commercial workers is that into:

(*a*) those persons who carry on commercial transactions, and

(*b*) those persons who record transactions.

The first group covers a very wide range of workers —from the entrepreneur at the head of a business employing thousands of persons and using millions of capital to the small shop-keeper. The second group also includes workers varying greatly in grade and responsibility.

Between the two groups are the persons engaged in

carrying on what may be termed standardized transactions; for example, a bank cashier, who is doing the same thing day after day, as thousands of other men are doing in other banks in different places, is carrying on a standardized transaction; he occupies, of course, a very responsible post. But a newspaper boy belongs also to this intermediate group; he always sells papers at the same price, usually in the same place, and often to the same people. His transactions may therefore be regarded as standardized; but he is certainly a member of the first group, since he has to decide every day how the race meetings, the criminal trials, the political speeches, and the weather are likely to affect his sales.

The division of the commercial workers into the two groups mentioned above certainly helps towards their classification, but it does not carry us very far, since each of the two groups needs separate consideration.

Taking first the needs of those who are concerned in the recording of transactions, since theirs is the simpler case. The provision of instruction for them was the first, and for many years the only, form of commercial education. Indeed, it is because the term 'commercial education' was for so long used to imply the teaching of shorthand, typewriting, and bookkeeping, that education described under this title has not enjoyed a high repute. The Annual Report of the Board of Education for the year 1930–1 shows that in that year there were 6,213 evening classes in shorthand, with 161,372 pupils; 2,068 classes in typewriting, with 48,146 pupils; and 952 classes in commercial correspondence and office routine, with 23,318 pupils. This does not mean that there were during that year about 160,000 persons preparing in evening schools for commercial occupations, since quite

a large proportion attend these classes with very vague intentions; but it does indicate that there is ample provision for giving young people some skill in the 'Office Arts', which are necessary for the recording of commercial and other transactions. Incidentally, it is of interest to note that during the same year, the number of classes in geography—a subject which is potentially of greater educational value than those mentioned—was 1,266, with 32,331 pupils. If we put aside the instruction provided for that grade of 'recorders' which is occupied with shorthand, type-writing, and the simpler forms of book-keeping, the problem of classification is a little simplified.

Next comes education for the branches of commerce which are ancillary to trading, that is, banking, law, secretarial work, insurance, accountancy, and transport. For each of these branches there is a professional institution, each of which has defined its standards of admission to membership. The requirements of these professional bodies are understood quite well by the schools, and students are usually forthcoming, at any rate in the larger commercial centres, in groups which are sufficiently large and homogeneous to be handled conveniently and economically. These also can be set aside, and the problem thus simplified still more.

Turning now to the great mass of commercial workers who remain for consideration. Their requirements are varied, when the country as a whole is considered; but there is enough localization of industry in the important centres of population to provide the groups of homogeneous students which are necessary for effective and economical instruction. This applies particularly to instruction relating to 'commodities', that is, goods and services which are sold.

INSTRUCTION RELATING TO COMMODITIES

As regards instruction relating to 'commodities', there is no doubt that any man who is selling goods should understand thoroughly what it is he is selling and should be well acquainted with its behaviour in use. Accordingly, some of the schools are now providing instruction relating to commodities in which there is wide dealing. This started with classes for retail dealers under the auspices of the Institute of Certificated Grocers After some time, the butchers interested themselves in the subject, and now there are flourishing classes for butchers all over the country; there are classes here and there for drapers, ironmongers, and furniture dealers. On the wholesale side of trading, classes have been set up for dealers in coal, yarns, timber, and grain, with great advantage to those concerned. The City of London College has done pioneer work in the teaching relating to commodities, a branch of instruction which is capable of considerable useful development in many industrial centres.

EDUCATION FOR SALESMANSHIP

It was because of the relatively backward condition of education for commerce that Lord Eustace Percy, when President of the Board of Education, set up a committee of business men under the Chairmanship of Sir Francis Goodenough to inquire into 'Education for Salesmanship' with special reference to the needs of our overseas trade. Although the title of the Committee appears at first sight to limit its activities, the inquiry was, in fact, an investigation of the provision of education for those aiming at commercial careers, since there is nothing in commerce which is not related,

directly or indirectly, to the sale of goods and services. The inquiry dealt therefore with the methods which should be employed for recruiting persons likely to be engaged in buying and selling, the methods which might be adopted for giving the recruits suitable and adequate training, and the part which schools play, or might well play, in the whole process of selection and training. It was therefore an attempt to find a wide and sound basis for our system of commercial education. The report, prepared after the receipt of evidence from more than 500 business men, covers most of the ground necessary for arriving at this basis, and should be consulted by those who are interested in education for commerce.

In addition to this formal inquiry by a Government committee, a good deal of patient, systematic inquiry is going on, especially in Liverpool, Manchester, Leeds, Hull, Bradford, Birmingham, Newcastle, South Staffordshire, and the City of London. In each of these centres a trained economist, having suitable experience apart from schools, has been appointed to study the question and to devise means for the satisfaction of the need. In all the centres the provision of instruction is being made with proper regard to local conditions Thus, in Liverpool, instruction is provided for persons engaged in the import of raw cotton and in shipping; in Manchester, special attention is paid to the training of persons engaged in the merchanting of cotton yarns and cloth; in Bradford, classes are arranged for those engaged in the manufacture and merchanting of worsted yarns and fabrics; and similarly, in the other centres mentioned, the curriculum of the school of commerce is being framed after the local needs and conditions have been carefully investigated.

A commercial school, like any other technical school,

must have an internal organization adapted at any moment for satisfying the external demands made upon it; it must also be ready to respond quickly to any changes in these external demands by the suitable adaptation of its internal organization. Looked at from this point of view, the Education Authorities of the important trading centres which have appointed specialists for organizing and supervising education for commerce within their areas have gone a long distance towards solving their problems; what is still needed is a great increase in the interest taken by commerce itself in what is being done to add to its efficiency.

CHAPTER XII

EDUCATION FOR COMMERCE (*cont.*)

GENERAL ORGANIZATION

THE organization of the instruction for students intending to follow a career in commerce is on lines almost identical with those for students aiming at a career in industry. There are thus:

(*a*) Evening Courses of Instruction, divided into Junior, Senior, and Advanced Grades.

(*b*) Part-time Day Classes.

(*c*) Junior Commercial Schools, parallel to the Junior Technical Schools.

(*d*) Senior Full-time Courses.

The proportion of commercial students attending evening classes only is very high, instruction during the day, whether for part or full time, being as yet infrequent.

EVENING COURSES OF INSTRUCTION

It is characteristic of commercial education that at every stage more options are offered to students than is usual in industrial courses. This is what might have been expected, both from the great variety of commercial occupations and from the comparatively recent development of education for commerce. However much freedom is permitted to students in their choice of strictly vocational subjects, a feature common to nearly all the courses is their insistence on a basis of general education which is adequate for the proper study of these subjects.

The following description of Junior and Senior evening courses is taken from the prospectus of the Union of

Lancashire and Cheshire Institutes, as they were drawn up by teachers and others thoroughly familiar with the students who present themselves and with their educational demands.

JUNIOR COURSES [1]

These are intended for students from about 14 to 16 years of age. For those who finish their full-time education at 14 the normal length of the course is two years, but those who remain at school a little beyond this age often enter the course in the Second Year; students who have completed the course of a secondary school are usually excused from attendance at a Junior Course and proceed directly to a Senior Course. The subjects are:

Obligatory. Arithmetic and Accounts.
English and Commercial Correspondence.

Optional. Geography.
Shorthand.
A foreign language.

As a rule, two hours a week are devoted to each of the obligatory subjects; and two hours a week to the optional subjects, of which one or two, but not more, may be taken.

SENIOR COURSES

These courses are planned to cover three years from about the age of 16; the subject of 'Commerce' is compulsory in each of these years. This subject covers a wide range, since the aim is to give the student a bird's-eye view of the general structure of commerce and an acquaintance with the functions of the various elements

[1] Usually provided in evening continuation schools

included in this structure. It deals therefore with such subjects as wholesale and retail trade, the functions of the manufacturer and the merchant, the constitution of different types of trading firms, transport, business management, and kindred topics. Necessarily, it devotes special attention to finance, including reference to the financing of transactions of various kinds, the pooling of risks, &c. When so great an amount of ground is covered, its treatment is bound to be somewhat superficial, but nevertheless the inclusion of this subject serves a useful purpose, as it gives the students some notion of the part they themselves play in a very complex organization, and indicates the essential unity of commerce, in spite of its infinite variety of phase.

The curriculum for each year is set out below:

First Year.

Commerce, together with *three* of the following:
Commercial Arithmetic,
English and Commercial Correspondence,
Geography,
Book-keeping,
Shorthand,
Typewriting,
A foreign language,
A trade subject, e.g. Cotton Manufacture.

Second Year.

As in First Year, but not so elementary.

Third Year.

Commerce, together with *two* of the following:
Book-keeping and Accountancy,
Commercial Arithmetic,
English and Commercial Correspondence, or
English Language and Literature,

Third Year (contd.).
Geography,
Shorthand,
A foreign language,
A trade subject.

It needs little consideration of these curricula to reach the conclusion that they are overcrowded for most students who wish to learn a foreign language. If a young man has obtained a fair knowledge of French or German during his full-time education, he can no doubt add to this by spending an hour or two a week in its further study at an evening class and at home; but for him to begin to learn a language in an evening class, and at the same time take the three other subjects included in the First Year of the Senior Course, is a difficult if not a hopeless task. The Government Committee on 'Modern Studies', reporting in 1918, said with reference to Junior Courses: 'We are informed that in these the teaching of Modern Languages has been attempted, but attempted without success. The pupils have no previous knowledge of any foreign language; the time they give is limited; and their deficiency in other subjects is such that they cannot devote adequate attention to language study.'

With reference to Senior Courses, the same Committee said: 'We are told that . . . few make progress in language work unless they have had previous language instruction. We do not question the observation, but we think that it would not be advisable to exclude such applicants without a trial. . . . But the Senior Courses suffer from grave disadvantages. They are commonly suspended during the summer months.' The Report goes on to say: 'As matters stand, evening classes in modern languages are chiefly valuable for adults who

know what they want and are determined to get it. For adolescents they may involve an excessive strain.' There is no doubt as to the truth of this last statement; students who begin to learn a foreign language in an evening school and try to combine with this task that of doing justice to the other normal constituents of a Commercial Course are attempting too much. It would be far better for the schools to recognize this, and to act on the sound assumption that real progress in a foreign language cannot be made without devoting some time to its study practically every day. There is thus much to be said for excluding foreign languages from the ordinary Senior Courses and arranging special language courses, which include a foreign language only, or a foreign language together with one other subject, which might well be that known as 'Commerce'. This plan is adopted in London and in some other centres, where schools offer a Modern Language Course, in which four hours a week are spent in learning a single language or, if the student has already some knowledge of one language, of two languages, the total time spent at school being six hours a week.

ADVANCED COURSES

As is to be expected, there is even greater freedom of choice at this stage than in the earlier stages, since the students are of mature age and know exactly what they want. In most schools where this stage of instruction is provided, there is a General Commercial Course, containing such subjects as accountancy and auditing, advertising and salesmanship, economics, secretarial practice, banking and currency, company law, costing, statistics, and modern languages; students may select

from this list a group of subjects which are suitable for their needs Much of the work of this grade is, however, in direct preparation for the examinations of the various professional Institutions Amongst these Institutions are the following: The Institute of Chartered Accountants, the Society of Incorporated Accountants, the Institute of Bankers, the Chartered Institute of Secretaries, the Incorporated Secretaries' Association, the Chartered Insurance Institute, the Faculty of Insurance, the Institute of Chartered Shipbrokers, the Auctioneers' and Agents' Institute, as well as others.

Although each of these professional bodies has its own special regulations for the admission of qualified men to its ranks, it is usual for all of them to require some study of economics and commercial law. There is thus a common nucleus of study for all these professional courses, but the requirements of the different bodies in this respect have not yet been completely coordinated, although useful progress has been made in this direction.

In addition, a certain number of students in Advanced Courses are working for the Intermediate examinations for the degrees of B.Sc. (Economics) and B.Com

In each of the more important Commercial Colleges there is normally a School of Languages, whose courses must be regarded as parallel to the Advanced Courses just described, since they attract a considerable proportion of serious students of mature age. The Birmingham Commercial College provides classes in French, German, and Spanish; the City of London College in French, German, Spanish, Dutch, Italian, Portuguese, and Russian; and the Manchester High School of Commerce in French, German, Spanish, Portuguese, Italian, Russian,

Swedish, Danish, Dutch, Arabic, Chinese, and Hindustani. It is very satisfactory that some study of the characteristics of the peoples using a language is often associated with the study of the language itself; the High School of Commerce in Manchester, for example, provides lectures in such subjects as 'The Economic Geography of Arabic Regions', 'The Characteristics and Mode of Life of the Arabic Peoples', as well as on similar topics in connexion with the study of other foreign languages.

In spite of all the efforts made by the schools to increase the amount of study of foreign languages of commercial importance, the response is small for a country which has a world-wide trade. During the year ending 31 July 1931, the number of students in grant-aided evening language classes was as follows: Arabic, 27; Chinese, 9; Danish, 99; Dutch, 100; French, 59,155; German, 20,004; Hindustani, 6; Italian, 2,367; Portuguese, 154; Russian, 343; Spanish, 10,664; Swedish, 93.

It must be taken into account that the universities and secondary schools, as well as other schools of full-time education, provide instruction in French, German, and Spanish at least, while the London School of Oriental Languages is doing much special work of this kind; but, even taking this into consideration, the volume of instruction in foreign languages other than French is disappointing.

PART-TIME INSTRUCTION GIVEN IN THE DAY-TIME

Considering the very great volume of instruction given in evening classes to students preparing for careers in commerce, the amount of similar instruction given during the day-time is very small. In 1930–1

the total number of students attending part-time day classes was about 2,200, of whom the majority were girls. Although there are no statistics available on this point, it is probable that few, even of this very small number of students, were released from employment for the purpose of attending school. No effort worth mentioning has yet been made by commercial firms to secure school instruction during the day-time for their recruits; in this respect they compare unfavourably with firms engaged in the printing, engineering, and building industries.

Various reasons are assigned for this. One is that firms, and especially those with overseas connexions, would suffer considerable inconvenience by releasing a number of their younger employees at regular intervals, since their correspondence, arriving from countries overseas, must be dealt with at irregular intervals; but this reason is not very convincing to any one who has seen the difficulties of release from industrial production overcome successfully. The main reason is probably that commerce has not generally realized that commercial education is anything more than instruction in the office arts of shorthand, typewriting, and elementary book-keeping. Whatever the reason, the present system, which demands almost universally that young people who are engaged in commercial occupations and wish to improve their qualifications shall attend classes in the evening after finishing a day's work, cannot be regarded as anything but unsatisfactory.

JUNIOR COMMERCIAL SCHOOLS

During 1930–1 there were in existence 40 of these full-time schools with a total enrolment of just over

5,000 pupils, of whom about 60 per cent. were girls. Although the schools are planned so as to be parallel to the Junior technical schools, they frequently admit their pupils at a slightly higher age, that is, shortly before the fourteenth birthday.

The course of instruction, which normally extends over two years, is intended to be in continuation of that of the elementary school, but it includes such subjects as shorthand, typewriting, elementary accounts and, as a rule, a modern language, in order that it may be a more effective preparation for the clerical occupations into which most of the pupils go on leaving. The Junior commercial schools are not yet sufficiently well known in the commercial world, although they are regarded as favourably as are the Junior technical schools in those areas where they have been set up.

The Committee on 'Education for Salesmanship' made the interesting suggestion that 'schools designed to train boys and girls to enter the retail trades should be established in important centres of retail distribution', and that these should be carried on as Junior commercial schools, receiving pupils for a two-year course from the age of 13 or 14 and giving them appropriate vocational instruction while continuing their general education. The Committee were led to make this suggestion by their knowledge of the success of the L C C. School of Retail Distribution, which, although not a Junior commercial school, possesses many of its features. In making the suggestion, they added that in their view it would be most unwise to set about establishing such a school in any locality either without previous consultation with the distributing firms or without their full support, since, as they pointed out, nothing would be more unfortunate

than to give to a number of boys and girls a specialized training for a particular career which, on leaving school, they found closed to them. This is a caution which should necessarily be borne in mind whenever a proposal is made for the setting up of any type of pre-employment vocational school.

SENIOR FULL-TIME COMMERCIAL COURSES

These courses are normally intended for boys and girls who have completed satisfactorily the curriculum of a secondary school up to the age of about 16. The total number of students in attendance at the 39 courses of this kind held in England was 1,244, of whom 1,003, or just over 80 per cent., were below the age of 18. The work may thus be regarded as being, in the main, parallel to the Advanced Courses of the secondary school, although in some instances attendance is for one year only.

There are four main types of course:

(*a*) A general training for those who aim at occupying responsible positions in commerce. At the City of London College the course, which is typical, includes: Business economics, an elementary study of commercial organization and practice—without any attempt to teach business routine, but with the object of giving students an insight into the structure of business and an understanding of common commercial operations—the elements of general mercantile and company law, mathematics applied to commerce, the principles of accounts and book-keeping, commercial geography, a study of commodities—such as tea, grain, and timber—English, and two foreign languages.

(*b*) Secretarial Courses for girls and young women.

(*c*) Intermediate B.Com. and B.Sc. (Economics) Courses.

(*d*) Courses for those engaged in a special branch of Merchanting.

Examples of this last type of course are those provided at the Bradford Technical College and the Manchester High School of Commerce for young men who are to be engaged in the merchanting of textile goods. The Manchester Course includes: a modern language, business economics, accountancy, the interpretation of accounts, banking and foreign exchange, fabric structure, cloth analysis, textile quantities, and the production of yarn.

The development of these courses in connexion with a particular industry is of great interest, since it may well be that it is in this direction, and in that of increasing the facilities for the study of languages, rather than in that of the study of matters concerned more directly with the financial side of commerce, that the growth of Senior Full-time Courses will take place.

The small part played by the Senior Full-time Course in the system of education for commerce indicates that this type of instruction is either not well known amongst commercial firms, or that it is not yet regarded very seriously by them. There is no doubt, however, that in some circumstances it may possess very great value. It is therefore desirable that the possibility of utilizing it more fully should be explored.

RECENT DEVELOPMENTS IN COMMERCIAL EDUCATION

For many years, whenever commercial education was mentioned, it was at once thought of as the train-

ing of young people for clerical work in offices, since it was originally started for this purpose; even now, many persons still look upon it as being concerned with a somewhat elementary grade of instruction. It has been realized, however, during the last few years that it is not sufficient to provide training for only those workers who are engaged in the recording of commercial transactions; and that the modern conduct of business demands the proper training of those officers on whom rests the heavy burden of carrying on these transactions and making decisions of very great importance. Undoubtedly, much of the knowledge and skill needed for those occupying posts of major responsibility can and ought to be acquired by actual experience. But it is just as certain that organized instruction in schools given by competent men of wide knowledge and outlook is a most useful adjunct to commercial experience; and it is as an adjunct to experience that instruction in commercial subjects should be generally regarded

Reference has already been made to the increase of instruction relating to the commercial aspect of particular industries, such as textiles; another closely related topic to which more attention is now being given is that of 'commodities', that is, either goods or services which are sold. Just as those engaged in production are learning more about commerce, so those engaged in dealing are finding more facilities available for learning the behaviour in use of their commodities. Instruction is now being given as to the qualities of coal, cotton goods, grain, oils and fats, oil seeds, paper, timber, and woollen and worsted goods. In some instances the instruction takes the form of lectures illustrated by specimens, while in others, for example that in timber

given at the City of London College, and that in woollen and worsted at the Bradford Technical College, the students have the advantage of working in laboratories properly equipped for the purpose.

Much of the instruction provided for retail traders is of this kind. The Institute of Certificated Grocers were the pioneers in this work and their example has been followed by the National Federation of Meat Traders' Associations, so that now in many parts of the country there are classes, attended by large numbers of keen students, in grocery and butchers' work. On a smaller scale, there are classes for booksellers, drapers, men's outfitters, and furniture, ironmongery, and boot and shoe dealers.

NATIONAL CERTIFICATES IN COMMERCE

There is not yet any scheme for the award of National Certificates in commercial subjects to students looking forward to a career in commerce, partly because the number of students is so great and their needs are so varied, partly because education for commerce is of more recent growth than is education for industry, and partly again because there is no single professional body in existence with which the Board of Education can co-operate in the same way as it does with the professional Institutions interested in the various branches of industrial production.

The matter is, however, under serious consideration, and it may be that the newly formed British Association for Commercial Education can be of service in organizing a scheme of certification on lines similar to those followed in the case of industrial students. It is probable, however, that it will be necessary to initiate

any scheme of this kind by dealing in the first instance with only the students in the Advanced Courses, leaving the question of certifying the attainments of younger students for further consideration when experience has been gained on a small scale with advanced students.

CHAPTER XIII

THE TEACHERS IN TECHNICAL AND COMMERCIAL SCHOOLS

WHEN it is taken into consideration that the prevalent form of technical education in England is that in evening classes, it is obvious that the problem of finding suitable teachers is far from simple. The approximate numbers of students attending classes under the 'Regulations for Further Education' in 1931 were as follows:

Day Continuation Schools	. .	20,600
Junior Technical Schools	. .	21,000
Senior Full-time Courses	. .	8,000
Technical Day Classes	.	27,000
	Total	76,600
Evening Classes	.	905,000
	Grand Total	981,600

APPROXIMATE NUMBER OF TEACHERS

In all, nearly a million students were in attendance in this school-year, but of these only 76,600, or about 1 in every 13, were in day classes. In these circumstances, it is necessary to employ a very large number of teachers during the evening only, and although there are no exact figures available, it has been estimated that the number of such teachers employed in schools admitting students at about the age of 16 is approximately 10,000. The number of teachers devoting all their time to teaching in technical and commercial schools is approximately 3,000.

FULL-TIME TEACHERS

It is on the full-time teachers that most of the responsibility rests for the planning of curricula and syllabuses of instruction; and necessarily so, since they are the only professional teachers employed. They may be divided into two main groups, each of which is capable of further subdivision

In the first group are those engaged in teaching pure science—mainly chemistry and physics, but including some biology—mathematics, languages, and such subjects as geography and economics, which are ancillary subjects in commercial courses. The members of this group have the same kind of educational antecedents as teachers in secondary schools, that is, they have usually received their early education in secondary schools and many of them are graduates. Some of them are men of high academic standing and a proportion of them carry on scientific research either on their own account in the intervals of their ordinary duties, or in association with advanced students as a means of giving these a training in the methods of scientific investigation.

The second group consists of that large body of men and women, with the most varied experience and attainments, who are concerned with vocational instruction These range from highly trained chemists, engineers, and economists to instructors engaged in teaching workshop operations. A number of them are university graduates, while those engaged in teaching mechanical and electrical engineering, gas manufacture, architecture and building, and textiles are frequently members of the appropriate professional Institution; many of the teachers of mining hold the First Class Mine Managers' Certificate, while the teachers of pharmacy have the

Major qualification of their professional Society. The great majority of those concerned with education for industry have had industrial experience at some time in their career; some of them have preserved a vivid recollection of this, while in others, probably less imaginative, the recollection of the workshop has become a little dimmed Although some scientific research is carried on by the members of this group, it is not so frequent as is consultative and testing work for industry, which serves to maintain the link between practising teachers and industrial firms.

The proportion of teachers of commercial subjects who have had business experience other than office work of some kind is not very large, but an increasing number of graduates in economics or related branches are taking up teaching work.

It is probable that only a small minority of the full-time teachers in this second group deliberately set out to become teachers; it would be a misfortune if they had. Their first choice of a career was almost invariably one in industry or commerce, and teaching has been a later choice. Sometimes this change of occupation has been made for reasons of temperament A scholarly man of good academic qualifications and with a liking for the society of young people often prefers the school to the workshop, the drawing office, or the sales department of a business undertaking; such a man is readily attracted to teaching students interested in his particular branch of knowledge. Quite a number of technical teachers have very different antecedents. They have distinguished themselves in evening classes and, as a result, have been selected to help a teacher with a large class of students in machine drawing or building construction, for example; after some time, when they have

found their feet, they have been entrusted with classes of their own; and finally, when they have gained skill and confidence, they have given up their ordinary occupation and devoted themselves entirely to teaching. The strength of such teachers is their intimate knowledge both of industry and of the aims of their students; their weakness is the narrowness of their experience, which has often been gained in only one or two schools.

PART-TIME TEACHERS

Like their full-time colleagues, part-time teachers can be divided into two groups. There are, first, the professional teachers who are engaged during the daytime in elementary or secondary schools, and come into the evening schools to teach the same subjects as they do during the day, that is, English, geography, mathematics, pure science, and modern languages. They are, as might be expected, very competent and, as a rule, adapt themselves readily to the altogether different circumstances of the schools for young employees.

In the second group are the teachers of vocational subjects, who are drawn almost entirely from industry and commerce. These teachers are amateurs, since their ordinary daily work by which they earn their living has necessarily the first call on their time and energies, and their work has the defects which are to be expected. On this point an Educational Pamphlet issued by the Board of Education [1] says.

'. Inspectors sometimes find it necessary to comment in their reports upon weaknesses of method, such as failure to save time and effort by substituting collective instruction

[1] *Education Pamphlet*, No 49, p 30

at suitable opportunities for repeated instruction to individuals, a tendency to demonstrate to students how more difficult operations should be done, instead of insisting that they should make their own attempts, undue dependence upon lecturing and insufficient questioning of students to make sure of the effect of the instruction; the laborious dictation, or *in extenso* writing on the blackboard, of lecture notes entailing waste of time on the one hand, and, on the other, a failure to train students in the taking of their own notes; or occasionally the failure to appreciate the need for the careful planning of a scheme of instruction in relation to the time the students can give to their studies.'

The Board's pamphlet goes on to say that, in spite of these defects, good work is being done by teachers drawn from industry. There is no doubt of the truth of this; the work is indeed far better than might have been anticipated, for it is to be remembered that there are few difficulties about discipline in a school of this type, attended as it is by keen young students. Further, all the students attend voluntarily. If they do not get what they need, or think they need, or if they are not interested, they stay away from the class, with the result that this dwindles in size. At a certain point, the class is closed or amalgamated with another, and the teacher who has failed to retain the attention of his students finds that his services are no longer needed. A process of natural selection of part-time teachers is always going on, and it is only the fittest who survive.

One sub-group amongst part-time teachers should be mentioned specially. It includes a number of young men of excellent academic qualifications who are in the early stages of a professional practice as accountants, lawyers, or architects, or, being recently qualified, are gaining experience in industry in posts which do not

carry a high salary. Most of them, as their professional reputation and standing rise, find that they can no longer spare the time for teaching and give it up. The contribution they bring to the evening technical school is, however, very valuable; all the more so, since the interest aroused in them is usually permanent.

THE PRINCIPALS OF TECHNICAL SCHOOLS

All technical schools of any importance are under the educational direction of a Principal, who is responsible for the whole of the work carried on in the day and evening classes of its various departments, as well as, in some instances, the group of evening continuation schools associated with the technical school. It is on him that the responsibility rests for the organization and educational administration of all these activities. It is on him, too, that the task is laid of establishing and maintaining close relations with the industrial and commercial firms in his neighbourhood. It has been said that 'no other educational post presents a close parallel to his ultimate responsibilities, whether internal or external', and it is certainly difficult to find one.

Many institutions have more than a thousand students, in some instances many more, and classes are being held every morning, afternoon, and evening during the greater part of the year.[1] It would be impossible for the Principal of one of the larger institutions to carry on his work effectively if he had not competent heads of departments, or other members of his staff

[1] For example, the Manchester College of Technology and the Birmingham Technical College have each nearly 6,000, Rugby Technical College over 2,000, Hull Technical College over 3,000, Bradford Technical College 2,300, and the Regent Street Polytechnic nearly 14,000 part-time students

with special responsibilities, to take upon themselves duties which he delegates to them.

In a great many instances the Principals have been teachers of chemistry or engineering, though a minority of them have taught other subjects, such as physics or mathematics.

It is only in the last few years, with the growth of a belief in the importance of education for commerce, that men with special qualifications for organizing this type of education have been appointed as Principals. Their task is normally rather different from that of the Principals of the old-established technical schools They have usually had to begin by investigating the educational needs of the commerce of their area and then to create an organization suitable for meeting these needs; the Principals of the technical schools have, on the other hand, found the schools in existence and their task has been that of adapting the organization to meet the changing demands of industry. In both instances, however, the Principal is an organizer and administrator rather than a teacher.

CLASSES FOR TEACHERS IN TECHNICAL AND COMMERCIAL SCHOOLS

Unlike the elementary and secondary schools, the technical schools have not the advantage of drawing teachers from training colleges which form part of the permanent machinery of the educational system All that is done for training teachers in technical schools is done by improvised and inadequate means; and in view of the fact that the great bulk of the teachers employed are employed for part of their time only, this is not surprising. The problem of training is dif-

ficult, since it is essentially that of devising means of giving a professional training to men who will usually remain amateurs. Difficult as the problem is, it cannot be shirked, since every year sees a raising of the average level of attainment in the evening classes of the technical school, owing to the rapidly increasing proportion of students of good preliminary education who enter them.

The Board of Education carries on classes each summer for teachers of engineering and building, and nearly every summer for teachers of commercial subjects and of textiles. These courses, which usually extend over about ten days, are held in residential institutions—sometimes in Oxford or Cambridge colleges and sometimes in a Training College—where the teachers can live together. There is no doubt of the very great value of these courses. It is not merely that they give the teachers opportunities of attending lectures and laboratory courses of instruction organized and conducted by men who are fully acquainted with their needs; the teachers derive great benefit from meeting others with different experiences and different outlook, coming from all parts of the country, and exchanging views with them.

In addition to these courses, there are shorter courses, usually extending over a week-end, held in different districts, some of these are organized by the Board of Education and others by Local Education Authorities. The aim of these is usually different from that of the summer courses, although they have the same feature that they are carried on in hostels in order to provide facilities for exchange of views and opinions. They are intended rather to stimulate and refresh teachers, who, working in isolation, need opportunities of comparing

notes with others, than to impart fresh knowledge of the subjects of instruction. That these week-end courses serve a most useful purpose is admitted by every one who has visited them. The whole question of the means to be employed for the training of teachers in technical and commercial schools and for keeping them in touch with the changing requirements of their students of all types is one that ought soon to be considered far more completely than it has so far been.

ASSOCIATIONS OF TEACHERS

There are three important associations of teachers in technical schools:

(*a*) The Association of Technical Institutes, whose members include both Principals of technical schools and members of their Governing Bodies. This is the oldest of the associations: it has done excellent work during the growth of the system of technical education, especially by bringing to a focus at its meetings and through its special committees the experience of both teachers and administrators.

(*b*) The Association of Principals of Technical Institutions, which includes in its membership the Principals of those technical schools of major importance which are known as 'Technical Colleges'.

(*c*) The Association of Teachers in Technical Institutions, whose membership includes teachers of various grades.

The relations of all three bodies, both with one another and with the Local and Central Education organizations, are close and cordial. It is by no means unusual for all three associations to co-operate in the investigation of matters of common interest and thus to

make useful contribution towards the development of a sound system of technical education Reference is made in Chapter XIV to such an inquiry now being made into the character of the buildings and equipment needed by technical schools.

CHAPTER XIV

BUILDINGS AND EQUIPMENT

THE activity of the Technical Instruction committees in the building of new technical schools during the ten years which succeeded the passing of the Technical Instruction Act in 1891 has already been mentioned. This activity was not surprising, for there was at this time great public interest in this form of education, which was then the only branch of higher education aided by public funds; all public expenditure on schools other than elementary was necessarily on those for instruction in science, art, and technology. In addition to the building of new schools, there was during this period much renovation and adaptation of existing buildings. The premises of old Mechanics' Institutes, of elementary schools superseded by schools more suitable for modern requirements, of unneeded factories and, in one instance, of a disused prison, were converted into technical schools. The buildings thus made available were sometimes of a makeshift character; it was often considered that all reasonable requirements would be met by the addition of a chemical laboratory, though some of the more important schools provided themselves with laboratories for teaching practical physics, biology, or metallurgy, since instruction in these subjects was aided by grants from the Science and Art Department, while a few others had mechanical laboratories and workshops, amongst the latter being those equipped quite frequently in Lancashire and the West Riding of Yorkshire for the teaching of textiles.

As soon as the Local Education Authorities set to work, the rate at which buildings for technical school

purposes were being erected slowed down, since, as has been said, the main task of these new bodies was for many years the creation of a national system of secondary education, and this in itself absorbed a considerable proportion of the funds available for building purposes The building of technical schools between 1902 and 1914 did not, however, cease. According to the Annual Report of the Board of Education for 1924–5:

'Of the counties, only Cheshire, Kent, Lancashire, Leicestershire, Middlesex, Somerset, Staffordshire, and the West Riding were active before 1918 (that is since the beginning of the century) In London, after completing the work in progress during the second period, the Council, before the War, provided a new building of the first order of importance for the Central School of Arts and Crafts, rehoused the School of Photo-engraving and Lithography, built new schools in Hammersmith and Lambeth, gave assistance to important enlargements of five of the polytechnics, and enlarged five of its own institutes Building work, rarely of the first order of importance, was done also at Barrow, Birkenhead, Blackpool, Bournemouth, Bradford, Burnley, Leicester, Liverpool, Lincoln, Manchester, Portsmouth, Rochdale, Sheffield, Smethwick, Stoke-on-Trent, Stockport, Warrington, Worcester, Cardiff, Newport, and Swansea'

Some of the buildings erected by the West Riding Authority during this period are of interest as being intended for the joint use of secondary and technical schools, and specially planned and equipped for both these purposes.

The importance of having properly equipped engineering departments was generally recognized during the first few years of the new educational phase, and accordingly most technical schools of any importance

found means during this period for installing mechanical laboratories and, in many instances, laboratories for the practical study of electrical engineering and heat engines. The last-named laboratories were originally equipped with steam-engines, as the internal combustion engine had not yet assumed its present importance

One obstacle to the provision of new buildings was the fact that expenditure on them had to be defrayed by the Authorities alone, without any definite assurance that any part of it would be defrayed from funds provided by the Board of Education. This state of affairs lasted from 1897, when the Science and Art Department ceased to make building grants to Technical Instruction Committees, until 1918, when the Education Act passed in that year reorganized the method of paying grants from the Board of Education, and made expenditure on buildings one to be shared equally between the Board and the Local Authorities concerned Although an Education Authority when planning a new technical school fifteen years ago could not point to any regulation entitling it to expect a State contribution to the cost, it was generally understood that its provision of more satisfactory premises would be accompanied by an increase in the rate of grant received on account of the attendances of students at the new school. The difficulty due to this being a mere understanding was in some cases very real.

Since 1918 there has been considerable expenditure on new buildings. In particular, there has been a great increase in the number of Mining Schools, owing to the grants made to Local Education Authorities for this purpose by the Miners' Welfare Committee. But even now there are arrears to be made up, and instances could be quoted of very important industrial

and trading centres where the provision is either extremely inconvenient or inadequate for existing needs. It is probable that there is no technical school in the country which is not filled on nearly every evening of the week during its session, and very few which would not be filled if additional accommodation on a large scale were available The only satisfactory alternative to a considerable building programme, as soon as the financial state of the country permits, is the redistribution of the 'load' on the existing accommodation by the substitution of day attendance for part of the attendance in the evening, a reform in the conditions of technical education which, for other reasons, is long overdue.

With the development, on the one hand, of advanced work in technical schools and, on the other hand, of Junior technical and Junior commercial schools, not only has the volume of work increased, but its scope, as well as the age-range of the students, has become wider. In many instances a technical school is expected to furnish accommodation for (*a*) a very large number of evening students, all over 16, who are studying subjects which range from practical acetylene-welding, carpentry and joinery, and plumbing to advanced engineering, chemistry, and other branches of science. For these students it must have proper laboratories, drawing offices, and workshops, which are in some instances equipped for one branch of work and are suitable for no other; (*b*) a much smaller number of day students from 17 to 21, some of whom are doing work which approaches the standard of that in universities; (*c*) a Junior technical school, with pupils of 13 to 16, who attend during the day-time; and (*d*) miscellaneous activities, including clubs and scientific societies.

It is clear that such varied activities demand considerable space for their exercise; and further, that the accommodation needed must provide for the requirements of both children and adults There can be no doubt of the desirability of separating the schools for boys and girls of 13–16 from those for older students. It is not merely that they need smaller furniture, but it is not advisable to have both children of this age and youths of 17–21 entering a school through the same door and using the same accommodation. This may at first sight seem a trivial reason for suggesting the separation of the classes for younger and older students, but it is to be remembered that these youths are at just the age when they have the strongest objection to being grouped with younger boys and girls Moreover, it is of great importance that the technical school shall be regarded by the general public as an institution of quite a different kind from the schools ordinarily attended by immature persons.

There is another kind of separation that may become necessary. In certain of the large institutions, where the volume of work of all grades has greatly increased, it may ultimately become advisable to provide the accommodation needed by excluding from the school much of the work of lower grade. In such cases, extension would not proceed by enlarging the central institution, but by building in suitable districts smaller schools to undertake the work of lower grade, including the workshop instruction which is being developed in some areas.

CHARACTER OF THE ACCOMMODATION

It is not possible to draw up a single specification which will cover the requirements of technical schools

of various grades, dealing with education for the very varied industries of the country. There are, however, certain characteristics which should be common to all of them. They should possess a sufficient number of class-rooms, as well as laboratory, drawing office, and workshop accommodation; a large hall for social functions, public lectures, and examinations; a central library, with seating accommodation for a fair number of students, and departmental libraries housed in the various departments; common rooms for staff and students; administrative offices for the principal and clerks; rooms for meetings of scientific and other societies; and, where the circumstances demand it, a refectory. Everything which conduces to fostering a strong corporate life should be available, and accordingly an attempt should always be made to provide facilities for outdoor games.

In planning the school, it is desirable to select a site which will admit of future extensions when necessary; and to include one or more rooms, unassigned to any purpose, in which a supply of gas, water, and electricity is installed Such rooms are of use when unexpected demands are made on the school. It is important that the rooms used for the practical work shall be so placed that noise or disagreeable smells do not penetrate to the other parts of the building.

All these demands can be met in buildings which, without being extravagant, are dignified and attractive in appearance. That this is possible is shown by such recent buildings as the technical colleges at Chesterfield, Barnsley, Northampton, Middlesbrough, Rotherham, and Wolverhampton, the technical institute at Wandsworth, and the extension to the Regent Street Polytechnic.

EQUIPMENT

The equipment needed in a technical school is broadly of two main types, that for teaching pure and applied science respectively. There is little difficulty in deciding about the supply of the former type, since its character does not change rapidly; what is needed is renewals and the occasional addition of new forms of apparatus. This applies to part of the equipment used for teaching applied science and technology, but not to all of it, since industrial processes are subject to constant change and the technical equipment of a school ought not to get out of date.

Fortunately, industrialists have been very generous in presenting both equipment and materials to technical schools, it having been estimated by the Board of Education that the annual value of their gifts some years ago was £40,000. Many of these gifts have been made by engineering firms, as they often take the form of machinery, but there are also gifts of such materials as yarns, dyes, and printers' ink. In some instances the gifts are made out and out by the donors, while in others they take the form of permanent loans, the donors undertaking to keep the plant in good order and to renew it when necessary.

The presentation of plant and materials to schools by industrial firms indicates a belief on their part in the value of technical education and a desire for its development. It has the solid advantage that it secures to the students facilities for the study of modern plant and modern ways of using raw materials. It provides also that the industries receive students trained to use this plant with intelligence; but the benefits to the donors are considerable, since they know that it is their

machines, and not those of their competitors, which are being displayed and studied by young men who may at some future time be purchasers of machinery, and will naturally be inclined to look favourably on goods with which they have long been familiar.

In at least one instance, a firm has offered to furnish a complete plant to a school on condition that no other machinery was installed. Such an offer, even if the machines are of great value, should not be accepted, as its acceptance might lead to the school having to refuse to install machinery more suitable for educational purposes.

There are deficiencies in the equipment of certain schools which should be specially mentioned. One is the lack of satisfactory equipment for instruction in commercial subjects. The Committee on 'Education for Salesmanship' noted this and recommended that every school teaching commerce should have a room specially arranged for lantern work and should possess a good supply of slides, maps, charts, and diagrams; they recommended too that, as instruction relating to commodities develops, their provision of apparatus for practical work on commodities should be extended considerably.

The other is the general inadequacy of the library provision It is important that every technical school, however small, should afford facilities to its students for consulting standard works of reference dealing with their subjects and some of the more important technical journals This can sometimes be arranged through the co-operation of the Committees which are responsible respectively for the technical school and the public library of the town.

AN INQUIRY RELATING TO THE BUILDINGS AND EQUIPMENT OF TECHNICAL SCHOOLS

At the present time, the Association of Technical Institutions and the Association of Principals of Technical Colleges, in association with representatives of the Royal Institute of British Architects and of the Board of Education, are considering the whole question of the buildings and equipment of technical schools, and their Report, when issued, should be of great service to all those concerned with planning and maintaining technical schools.

The Period from 1933

CHAPTER XV

THE DEVELOPMENT OF THE SYSTEM OF GENERAL EDUCATION

INTRODUCTORY

IT is inevitable that one who has spent the greater part of his working life in a particular activity will be inclined to reflect on the past and, in the light of his reflections, to speculate as to the future. I propose therefore to discuss, as briefly as the subject permits, what has been said in the preceding chapters about the English system of technical education—even at the risk of repeating myself now and then—and to offer some observations as to the direction in which it appears to be moving. But before doing so, it is necessary to describe, at any rate in outline, the way in which our national system of general education has assumed its present form. I offer no excuse for doing so, since it is only on the firm foundation of a good general education that a stable system of technical education can be built; and, as general education improves, so ought technical education to improve with it, and have an organic relationship with it.

THE PHASES OF EDUCATIONAL DEVELOPMENT

No one, looking at the history of education as a whole in this country, would, I think, be inclined to regard its progress as having been continuous. It is possible to discern a series of separate phases through which it has passed, to distinguish each phase clearly from those which precede and follow it, and to explain how and why each phase has begun. Throughout English educational history since the Industrial Revolution, it has

been usual for developments to proceed, often as the result of the enthusiasm and energy of individuals and voluntary bodies, until a point has been reached at which public opinion has demanded that the State shall take action. The existence of the phases or periods I have mentioned is due to this fact, since each successive addition made by Parliament to the Education Acts has given an impetus to educational progress and speeded up development; when this impetus has nearly exhausted itself, the progress due to it has become more slow, although sometimes other impelling forces have come into action and maintained the rate of development.

THE FIRST PHASE

The first phase which need be considered here—for we are concerned primarily with education for industry and commerce—is that which comes between the Industrial Revolution, at the beginning of the nineteenth century, and the passing of the Education Act of 1870. When the processes of manufacture began to be centralized in factories, and our great industrial towns were coming into existence, many philanthropic persons, looking at the lives of the new factory workers, desired ardently to do everything in their power to improve not only their material but also their moral and intellectual state. This desire led to the establishment, early in the nineteenth century, of two great Societies, each aiming at giving to poor children opportunities of learning. These were the 'British and Foreign Schools Society', founded in 1808, which aided both undenominational and secular instruction, and the 'National Society for Promoting the Education of the Poor in the Principles of the Established Church', which helped

the establishment of schools providing secular instruction as well as instruction based on the Book of Common Prayer and the Catechism.

For older persons the Mechanics' Institutes were established, and although their functions were not quite the same as those of the elementary schools, since they appear to have provided no religious teaching, their promoters, like the founders of the two Societies concerned with elementary education, were moved by the desire to help the poor to lead better and fuller lives. The essential difference was that the elementary schools were intended for the education of children, while the Mechanics' Institutes were places where older persons, with their feet already set in the way they should go, could learn something of science, of its marvels, and also, for some persons, of its utility.

All our history shows that, as a nation, we are very loath to substitute a fresh habit of thought for one to which we have long been accustomed, especially if this has any relation to the welfare of others less fortunate than ourselves. It is therefore important to note that the first organized provision of education, after the Industrial Revolution, was made for 'the children of the poor' and for 'mechanics' We began by providing moral and mental instruction for workmen and the children of workmen, and we continued to do so for about a hundred years, without having much regard to the need for organizing this kind of education for others.

It is of interest, though perhaps not very profitable, to try to discover what reasons existed for this, in addition to that constituted by our national unwillingness to adopt fresh ideas. One reason may have been that, until towards the end of the nineteenth century, the workman had no parliamentary vote. He could take no

active steps to bring about the establishment of schools; and accordingly, other persons, seeing his helpless state and sympathizing with his difficulties, did what they could to stimulate legislation for his benefit and for that of his children. Some support is given to this view by the fact that our early educational legislation was combined with factory legislation. Thus, the Factory Act of 1802, in addition to making regulations about the working hours and other conditions of labour of apprentices in cotton factories, required that all apprentices should, during part of their apprenticeship, be given religious instruction and taught reading, writing, and arithmetic. The Factory Act of 1833, besides making fresh regulations about working conditions, required that all children employed in factories should receive two hours' instruction in schools daily.[1]

It is probable, however, that the most important factor was the very general feeling that the State should interfere as little as possible in educational matters. It is not necessary here to discuss fully why this feeling existed, but it may be said that many people feared that State interference with education would tend to injure the liberty of the individual. Thus Mr. D. C. Somervell says:

'Disraeli took the line that State-controlled education leads to the enslavement of opinion He pointed to China in the East and to Prussia in the West as examples of the crushing tyranny of a paternal government. "It has been discovered", he said, "that the best way to ensure implicit obedience was to commence tyranny in the nursery. The same system which tyrannized in the nursery under the pretence of education would . . . immure old age in their hated walls under the specious plea of affording relief."'[2]

[1] Adamson, *English Education, 1789–1902*, pp 19, 35

[2] D C Somervell, *Disraeli and Gladstone*, p. 43

Whatever the causes may have been, the fact is that during the whole of the nineteenth century the State did not concern itself directly with the education of persons outside the ranks of wage-earners. Its grants were made either through the Education Department in aid of elementary education and the training of elementary teachers, or through the Science and Art Department in aid of the instruction of older persons belonging to the 'industrial classes', that is, persons who were not 'assessed to the Income Tax'.

THE SECOND PHASE

During the latter half of the nineteenth century it had become generally obvious that there was great need for improving the condition of elementary education in the country. Excellent as had been the work of the voluntary agencies, which had done so much to provide what came to be known later as 'Voluntary Schools', there were localities in which the supply of elementary education was still defective. It was not, however, until 1870 that an Education Act was passed which made attendance at elementary schools compulsory on all children who were not being satisfactorily taught in other ways. It gave powers to localities to set up School Boards, charged with the duty of establishing and maintaining elementary schools within their areas, and enacted that these new bodies should have the power to raise the rates necessary for performing their functions effectively. Like the voluntary schools, which continued to exist side by side with them, the 'Board Schools' received grants from the Educational Department based on the number of children reaching a specified standard of proficiency in the subjects they learned.

The passing of this Act was in itself of great significance, since it indicated that the State had decided at last that education could not be left entirely to voluntary agencies, even when these were in receipt of Government grants. The fact that the State proposed to devote more money from the taxes imposed by Parliament indicated a notable advance in the public feeling towards education; but even more remarkable was the circumstance that henceforth elementary education was to be aided from rates raised locally, for, as we all know, the Englishman pays his taxes in sorrow, but his rates in anger.

No provision was made in the Act for developing secondary education, badly as this was needed; but this did not prevent the School Boards, as well as some voluntary bodies, from carrying on, with the passive consent of the Government, what were called 'Higher Grade Schools', many of which retained pupils until they were close on 16 years of age. Some of these schools received grants in respect of their younger pupils from the Education Department, and in respect of their older pupils—who were in that part of the school known as an 'Organized Science School'—from the Science and Art Department. The total number of these older pupils in 1901 was 8,670, distributed over 48 schools.

Side by side with the development of full-time general education was that of the science and art schools, to which reference was made in Chapter III.

By the end of the century it was generally recognized that new legislation was urgently needed. The State had fostered the growth of elementary education for thirty years; there was now a coherent system, a body of trained teachers, and a clear definition of the scope and functions of elementary schools. Moreover, the

whole population thoroughly understood the system, since a complete generation had passed through the schools. That the way was now open for the creation of a system of secondary education was obvious from the fact that the School Boards had been allowed to conduct secondary schools, and to receive grants from the two Government Departments concerned, though it was later decided that they had no legal powers to do so.

THE THIRD PHASE

The first step towards bringing order into the chaotic condition of our educational arrangements was the combination of the Education Department and the Science and Art Department into a single Department—the Board of Education—in 1900. This was a necessary preliminary to any legislation intended to create a single system of education for the whole country.

The second step was the passing of the Education Act of 1902, which abolished the School Boards, and placed on County and County Borough Councils the responsibility for most of the local activities connected with education; though some of these—for example, the provision of university education—fell outside their functions. The County and County Borough Councils became Local Education Authorities, which, taking over from the School Boards, as they did, a great part of the elementary education system of the country, swiftly built on that solid foundation a comprehensive system of secondary education. This has been their main task, though by no means their whole task, during a quarter of a century. It is its successful completion which will render this phase memorable in the history of education in England. The speed of development of secondary

education during the last generation may be measured by the fact that the number of pupils in grant-aided schools of this type, which was 94,000 in 1905, rose to 156,000 in 1910, to 308,000 in 1920, to 386,000 in 1929, and to 411,000 in 1931. There are thus more than four pupils in grant-aided secondary schools at the present time for every one pupil in such schools 26 years ago. The average school life of the pupils has gradually lengthened, until now the average age of leaving is just over $16\frac{1}{2}$.

Parallel with this development of secondary education in England has been the growth of the 'Central' or 'Modern' school, which has a leaving age of about 15; this school continues the general education of the elementary school, often, however, with a slight bias towards the needs of industry and commerce during the last two years of its course.

The rapid increase in the number of pupils in both secondary and central schools has been fostered by the reorganization of elementary education which has taken place in recent years, as a result of recommendations made by the Consultative Committee of the Board of Education under the Chairmanship of Sir Henry Hadow. Grant-aided schools will in future be divided into two groups:

(*a*) Primary schools, that is, schools for children up to about the age of 11, which, when reorganization is completed, will be self-contained.

(*b*) Post-primary schools, that is, schools for older children, of whom the majority are transferred to them from the primary schools at the age of 11. Some of these are elementary schools, with a leaving age of 14; some are central schools, with a leaving age of about 15; and some are secondary schools, with a

leaving age of at least 16, though it may be as high as 18 or 19.

The transfer of children for free education to secondary schools, as well as to some of the central schools (the 'selective' type) is made as the result of a test applied to the children of the primary school just before they reach the age of 11. It is clear that, if this test is properly devised and carried out, the children transferred will be likely to derive benefit from a prolonged education.

THE PHASE WE ARE ENTERING

Before going on to discuss the next great phase of development, it will be worth while to summarize briefly the characteristics of the preceding phases through which our system of general education passed during the nineteenth century. These are:

1. The Voluntary phase, which finished in 1870. During this period elementary education was provided by voluntary bodies, aided to a comparatively small extent by funds granted by the State. It was by no means universal.

2. The phase during which the system of elementary education, which had been made compulsory by the Act of 1870, was being built up and consolidated, partly by the existing voluntary bodies with the aid of Government grants and partly by the School Boards, who received Government grants and could also raise local rates to defray the cost of the schools they established. During this phase there was no legal public provision of secondary education, though in some instances the School Boards exceeded their powers and carried on Higher Grade schools with a high leaving age.

3. The phase during which the Local Education

Authorities, exercising the extensive powers given them by the Act of 1902, have (*a*) created a comprehensive system of secondary education, (*b*) reorganized elementary education and established a large number of central schools with a leaving age higher than 14.

Neither of these tasks could have been performed successfully if the system of elementary education, where they have their origin and on which they depend, had not been created and made effective during the preceding phase.

Inevitably, the question of the characteristics of the new phase, on which we have already entered, is one to be seriously considered, since in any living organism the completion of one stage marks the beginning of another, which is connected with it and indeed grows out of it.

In my view there are two main tasks, in addition to that of consolidating the ground already won. The first of these is that of converting the secondary school, as it now exists, into a more flexible instrument for the common welfare. The second is that of bringing the system of technical education into proper relationship on the one hand with our methods of general education, and, on the other, with the needs of industry and commerce, and thus making it a more effective means of improving the national prosperity. I propose to leave the discussion of this second task for later chapters, and to deal now with the first task only.

There are many signs of a belief that secondary education is too rigid and too uniform. The blame for this is placed by different persons on different shoulders, but most often it is assigned to the persons and bodies responsible for the organization and conduct of the School Certificate examination. It is suggested that the struggle to bring pupils up to the point of passing this

examination—and especially of seeing that they secure sufficient 'credits' to be excused from the examination for University Matriculation—is so intense that the schools tend to become forcing houses rather than places of real education. It is noteworthy that two Committees, appointed by the Board of Education with very different terms of reference, have both recommended that the School Certificate examination shall be entirely dissociated from Matriculation. This is of special interest because one of these Committees, appointed to consider the First School examination, was composed of educational representatives, while the other, appointed to consider 'Education for Salesmanship', included only business men. The fact is that examinations, like so many other things, are good servants and bad masters. In my opinion, there is much to be said, not only in favour of examinations, but in favour of a rigid system of examinations, so long as this is carried on *for a limited period during a certain stage of development.* The secondary schools have been growing with immense speed, and without some fairly rigid control—such as that constituted by the School Certificate examination as it now exists—they might have grown in a haphazard way, with all kinds of useless excrescences and great variations of standard, so that no one, wishing to employ an ex-secondary pupil, would have been able to judge without special inquiry what his attainments were No one desires to see dead uniformity in any branch of education, since, if anything ought to be full of vigorous life, it is education; but every one wishes to see order in every branch, and this is impossible in an imperfect world unless standards are established and maintained. When once proper standards have been instituted, and those concerned are familiar with them, the restraints which are

undoubtedly constituted by an inflexible system of external examinations can be removed.

I am dealing somewhat fully with this question of making the secondary school a more adaptable instrument, since it has an important bearing on the future of technical education. Every parent who sends his boy or girl to a secondary school (or indeed to any school with a leaving age higher than 14) has some kind of ambition for him. It may be merely to place him, or to maintain him, in a certain rank of society; but very frequently there is a definite intention that he shall enter industry or commerce or one of the professions. The natural result of the existence of ambitions like these amongst so many parents is that there is continual pressure on the school for some degree of specialization in the curriculum in order that their children may enter as soon as possible on the path that seems most likely to lead them to the goal they have in view. At the present time, the existence of the School Certificate examination in an inelastic form constitutes a stout barrier against this pressure, but there is always the risk that its ill-considered modification may lead to too great yielding to the pressure, which, it must be remembered, is due to the proper ambitions of the parents, but may be reinforced from the side of industry and commerce—and this on the ground that there is general agreement, amongst both those concerned with education and with business, that the secondary school should be less stiff in its reactions to external conditions.

In my opinion, any modification of the curriculum of the secondary school should not be in the direction of making it vocational, but rather in that of ensuring that it forms a suitable basis for the vocational education of the technical school. There are a number

of factors which limit closely the amount of possible specialization in a secondary school. In the first place, its pupils have no workshop or office experience on which to draw, and the school cannot provide this except incompletely. Again, no study of industrial processes depending on the application of science to manufacture can profitably be made without a competent knowledge of physics, chemistry, mathematics, and mechanics, and the study of these subjects, with the addition, I hope, of that useful and attractive subject, solid geometry, must have the first claim on the time of the pupils. There is another important limitation affecting the amount of specialization possible in a school; while the pupils are going into very varied occupations, they must be grouped into classes which are of reasonable size and fairly homogeneous; there cannot be specialized instruction for very small groups.

Although, for reasons given, the secondary school should, at all costs, remain a place of general education, it ought certainly to do all it can to smooth the path for its pupils about to enter the new and strange world of industry and commerce; and that it can do this without losing its character and becoming a mere hybrid institution, I have no doubt.

CHAPTER XVI

THE DEVELOPMENT OF TECHNICAL EDUCATION

THE EARLY LACK OF INTEREST IN TECHNICAL EDUCATION

AFTER the somewhat lengthy discussion of the various phases through which general education in England has passed, it is time to return to our main topic.

The history of technical education during the nineteenth century is just as depressing as is that of general education. It was in vain that Dr. Lyon Playfair, and a host of other persons well acquainted with the facts, pointed out that, in so far as industry was progressing more rapidly on the continent of Europe than in this country, it was doing so because of the better education of the employers and responsible officials in the various branches of manufacture. This was stated again and again in England, but without any action being taken to remedy the defects It is difficult, looking back on the apathy of successive Governments, to understand why so little was done. There appear to have been several adverse influences, in addition to the feeling, which disappeared very slowly, that the less Governments meddled with any form of education, the better for it and for the nation.

In the first place, England was a very prosperous country, with a standard of life higher than that in most continental countries, and the question of providing technical education, or even secondary education, was not regarded as one of vital importance. We had developed our industries to such an extent that England could claim to be the 'workshop of the world', and had been able to do this without any highly organized

system of technical education. Why then should any one listen to the pessimists, who cried dolefully that a less prosperous time was at hand and that we ought to prepare in the years of plenty for the years of famine? Even a clear-headed man like Professor Huxley was quite contented with the kind of technical education provided for the 'industrial classes', and saw no reason for the State doing anything to provide similar facilities for employers and managers of workshops and factories. Writing on technical education in 1877, he said: 'I see that spread of scientific education, about which I have so often permitted myself to worry the public, become for all practical purposes an accomplished fact. Grateful as I am for all that is being done in the same direction in our higher schools and universities, I have ceased to have any anxiety about the wealthier classes.' If Huxley, an apostle of the teaching of science, held views like this about the need for the training of those persons on whom rests the great responsibility of organizing and conducting industrial concerns, it is not surprising that Governments, composed of laymen, turned a deaf ear to the lamentations of the less complacent but better informed men who knew what scientific education was doing for industry abroad.

In the second place, there is little doubt that many worthy people, who knew little of industry, regarded it as being carried on mainly by Gradgrinds for their own advantage, and did not realize that we, as a nation, had committed ourselves so fully to earning our livelihood by means of manufacture and trade, that the proper conduct of industry had become a function on whose proper and efficient performance the welfare of the whole population was vitally dependent.

RELATIONSHIP OF TECHNICAL AND GENERAL EDUCATION

The result of these various influences was that during both the first two phases of general education which I have described earlier, the development of technical education was slow and difficult. If, by the term 'technical education', we meant the mere imparting of manual skill to workmen, it would not be necessary in its consideration to have much regard to general education, since a quite illiterate man may be an excellent workman. But, as we saw in Chapter VII, we have for a century devoted little attention to the training of the workman as workman, and have looked upon technical education as being the means of giving to those entering mills and works a knowledge of the scientific principles underlying workshop practice and of showing how these principles are applied industrially. It is true that, in some branches, we have had to depart from this definition, but even in these we have never lost sight of it.

If the scientific principles on which industrial practice is based had no reference to human interests and human activities apart from industry, instruction in them would have no place in a scheme of general education; it could be properly provided in a scheme of technical education only. It happens, however, that the basic scientific knowledge applicable to industry—that is, physics, chemistry, mathematics, mechanics, and biology—is equally applicable to every material activity of mankind; and hence there is a fitness in the inclusion of means for obtaining this knowledge, and the outlook and habit of mind that go with it, in the schools which exist for the purpose of giving a general training for dealing with the affairs of life and of developing a broad

outlook over them. Clearly then, these schools and the technical schools have a close and organic connexion with one another.

TECHNICAL EDUCATION DURING THE SECOND PHASE

During the second educational phase (1870–1902) which I have described, a phase in which elementary education became universal and compulsory, there was naturally some development of technical education. The classes carried on under the central supervision of the Science and Art Department and the City and Guilds of London Institute, with the local stimulus due to the newly formed Technical Instruction Committees, could now for the first time rely on having a steady supply of students who were, at any rate, able to read and write and do elementary calculations; but this foundation of elementary education, definite as it was, could not be regarded as generally adequate. It was a slender basis for a superstructure of advanced knowledge. Some of the students in the technical schools were, however, of outstanding ability and overcame in a remarkable way the defects of their early education. Many of them became leaders of industry and commerce, while others, as may be seen from any list of holders of the National Scholarships awarded thirty years ago to candidates at the science examinations of the Science and Art Department, distinguished themselves in other fields of activity.

TECHNICAL EDUCATION DURING THE THIRD PHASE

It was not, however, until some years after the opening of that phase of education which began with the passing of the Education Act of 1902, that the Local Education Authorities were able to look with satisfaction

on what they had accomplished for technical education. They had had to convert the evening continuation schools into an effective bridge from the elementary school to the technical school; to extend the range of instruction in the evening classes of the technical school; to develop the system of Grouped Courses of instruction; to establish full-time vocational courses for pupils who had completed their full-time general education in schools of different grades; and to begin to replace evening instruction by part-time day classes.

It is on these lines that the recent development of technical education in England has proceeded.

THE DEPENDENCE OF PROGRESS ON DIFFERENTIATION

Consideration of the progress of education in England indicates that its development has been along two different paths. The first is by the expansion of the facilities. Thus, we began by setting up voluntary schools, maintained at first by the gifts and subscriptions of philanthropic persons and afterwards subsidized by the State; then we established elementary, secondary, and technical schools, which are maintained out of funds publicly provided. Not only has the provision of schools been greatly expanded in this way, but we have gradually increased the length of the school life of pupils by raising the age of leaving; the result of these two movements has been an enormous increase in the total volume of the education provided in the country as a whole.

But there is another important factor on which educational progress is dependent. This is the more accurate specification of the precise functions to be performed by schools, and a consequent handing over of separate functions to different parts of the complete educational

organization. This is the process which I have, for convenience, termed 'differentiation'. It consists of separating different functions and either entrusting them to different schools, or assigning them to different 'sides' of the same school.

Examples of both forms of differentiation are numerous. The 'Hadow' reorganization of elementary education consists of entrusting 'Primary' education to the Junior School, and 'Post-primary' education to other forms of school detached from the Junior School; it is thus an example of the first form of differentiation. The division of the central school at the top into an Industrial and a Commercial side, the establishment of Advanced Courses in the secondary school, of Classical and Modern sides in the public school, and of a number of Honours Schools in a university are all instances of the second type of differentiation.

Turning to the organization of technical education, we have already seen the separation of the work of the evening continuation school from that of the technical school, with the consequent approach to stabilization of the age (and other conditions) of admission to the latter institution, and the division of the curriculum of the technical school into a large number of grouped courses; and it may be that this process of differentiation in technical education will proceed much farther.

THE FURTHER DIFFERENTIATION OF TECHNICAL EDUCATION

In view of the close relationship between general and technical education, on which I have so often insisted, it might be expected that the organization of technical education would be conformable with that

of general education; in other words, that the process of differentiation into types and grades which has taken place in elementary and secondary education would have brought about a corresponding, though not necessarily identical, differentiation of technical education. In fact, such a differentiation has begun, but during a period of development it must lag a little behind the modification of the system on which it depends. The separation of full-time technical education into post-elementary and post-secondary courses in Junior and Senior technical schools respectively was not made—and indeed could not have been made—until 1905, three years after the Local Education Authorities had been created and had begun to expand the system of secondary education.

When we turn to the organization of the part-time classes of the technical school, which constitute by far the greatest proportion of its work, we see immediately that the process of differentiation, while being fairly complete as regards the Grouped Courses, has not proceeded very far in the direction of separating students according to their degree of previous education.

A generation ago the elementary school was an undifferentiated institution, and the number of secondary schools was small. Accordingly, the elementary school contained pupils of all grades of ability—in some instances first-rate—and the best of them became students at the technical school, often spending a year or two in an evening continuation school; the evening classes of the technical school were indeed composed almost entirely of ex-elementary school pupils. But now the stream of children passing through the Junior school (i.e. the 'primary' school for children up to the age of 10 or 11) is divided at about the age of 11 and the elements

of which it is constituted sent into three different grades of post-primary school, the division being made on the result of a test applied by the Local Education Authority to the children in the Junior school as they finish their course there. Those children who appear to be most suitable for a prolonged general education are offered free places in the secondary school; the next most suitable free places in the central school; the remainder, the unselected main body, go into the Senior elementary school until they reach the age of 14. If the test of fitness to profit by an education prolonged beyond the age of 14 is properly devised and carried out, the inevitable result will be the production of an intellectual *élite*, picked out from their fellows because of their possession of outstanding mental qualities, and then given the advantages of a school life extended for at least two years beyond the age of 14. There will also be a vast number of unselected persons, whose qualities, when tested at the age of about 11, do not appear to justify those responsible for devising and carrying out the test in recommending that they shall be transferred, with free places, to schools with a leaving age higher than 14. We have, in fact, so organized our educational arrangements as to lead to a greater intellectual stratification of the population than before.

This is, at first sight, a depressing prospect, especially to older people, for we have long been accustomed to view with great satisfaction the 'vertical mobility of labour' which has long existed in this country But this stratification is not an entirely new phenomenon in England. It has long existed; but now, instead of coming about in a haphazard way as a result of the ability, diligence, good health—and, I would add, the good fortune—of individuals, it is being brought about

systematically as a result of our educational policy, and it is affecting not merely individuals, but groups. There is another fact that must not be forgotten. The existence of these strata does not imply that the members of the upper stratum, who receive its material and other less substantial rewards, will come from a different social level. They will come from just the same grades of society as before, but will in many instances travel by an easier path.

Moreover, the process of stratification through the organized selection of groups of gifted individuals will always be incomplete; and this is a matter for satisfaction, since it is of the first importance that the way to positions of great responsibility or of high repute shall always be open to men of character and ability, even if they have been deprived of early educational advantages through their lack of intellectual maturity at the age of 11, or through other circumstances.

How does all this reorganization of general education affect the internal economy of the technical school? So far its effects have been slight, since the reorganization is new and not yet complete; but there are signs that ultimately they will be considerable. Already the proportion of evening students in technical schools who have remained at school beyond the age of 14 is considerable, being, in some instances, as high as 50 per cent. of the total number. There are thus two diverse elements in the stream of students entering the evening classes of the technical school, one element being constituted of pupils who have had an education prolonged on account of their special abilities, and the other containing pupils who, not having displayed any outstanding qualities when tested at the age of 11, have finished their full-time education at 14. If the two different

types of students were directed, on entering the technical school, into separate courses, there would be no problem to solve; but, in fact, both types freely enter the same Major Courses of instruction, the inconvenience due to the disparity of their qualifications being diminished as far as possible by admitting students of good preliminary education into the second, or even the third, year of the courses.

INDUSTRIAL RECRUITMENT

There is another factor to be considered Many industries are recruiting in just the same way as they did a generation ago, that is, almost entirely from the elementary school, quite regardless of the fact that the elementary school has changed so greatly; the proportion of ex-elementary students in the courses of instruction intended to serve the educational needs of these industries is accordingly high. The 50 per cent. of the total number of students who, in some technical schools, have received a prolonged preliminary education is an average figure, the proportion of commercial and engineering students belonging to this category being high, and that of students of textiles, building, and mining being lower. If and when industry generally becomes familiar with the modern organization of education, and adopts a recruiting policy which takes full account of it, the proportion of students of good previous education in the part-time classes of the technical school will increase considerably. Even now it is surprisingly high, considering the conditions.

THE POSSIBLE DIMINUTION OF EVENING STUDENTS

So long as students of short preliminary education are in a majority in any Grouped Course, they will set

the pace and the syllabuses will be framed mainly for their benefit; but as the other element increases in volume, there will be a tendency to raise the standard of the syllabuses and the teaching, and the ex-elementary students will find increasing difficulty in reaching this standard, with the inevitable result that they will be discouraged in their attendance at classes which they share with students of better education.

It has been pointed out earlier that one of the motives attracting young men to the voluntary classes of the technical school is that of ambition. If, as seems likely, those who left school at 14 begin to see that their ambitions are becoming far more difficult of realization because of the competition of young men who have had greater educational advantages than they have themselves enjoyed, a very powerful impulse to study will disappear; in these circumstances, it will be only the most determined and capable of this group of students who will persist in their attendance at Major Courses of instruction.

It is possible, of course, that those who find the Major Courses too advanced for them will join the Minor Courses to which reference was made in Chapter VII, and that the main effect on evening clasess in technical schools of the reorganization of the national educational system will be a movement of students from Major to Minor Courses, the latter gaining strength by the addition of students who are quite capable of following with advantage the present Major Courses. This development would be quite in accordance with the progress made in every branch of education through the differentiation from one to another of separable educational functions.

That it will take place on any considerable scale is, I think, improbable. It is far more likely that young

men who find their ambitions frustrated by their inability to compete successfully with others of better antecedent education will not enter Minor Courses in any great numbers Many of them, being voluntary agents and balancing the uncertainty of the material rewards of the successful completion of a Minor Course against the certainty of loss of leisure and expenditure of energy, will decide against school attendance. This would be a serious loss to industry, as attendance at part-time classes has great value. Although it brings tangible benefits to only a small proportion of evening students, it does ensure that industry receives, on the whole, a large number of students who have had their interests roused and their minds disciplined by organized study under skilful guidance. We cannot afford as a nation to part with such an asset, but must consider what means shall be employed for preserving unimpaired this valuable element in our industrial population. In my view, the only sound means of doing this is to arrange that, for workers of the type now under discussion, technical education shall be provided without calling on them to give up more than a small part of their leisure. The means of doing this are discussed later.

CHAPTER XVII

TECHNICAL EDUCATION IN ITS RELATION TO THE NEEDS OF INDUSTRY AND COMMERCE

SO far, I have been dealing with the question of the proper co-ordination of general and technical education; but there is another question equally important, namely, the suitable co-ordination of technical education with the demands of industry and commerce.

THE STUDENT NO LONGER AN INDIVIDUALIST

For many years technical education was shaped 'in accordance with the views of teachers and the ambitions of students'; industry and trade, which were then flourishing, took very little active interest in it during these years. The student was an individualist, working for his own benefit and regarded with benevolence by those who watched his progress towards the realization of his ambitions. Sometimes, this benevolence became active, and his employer paid his fees, or gave him prizes or, in rare instances, allowed him 'time off' in order that he might pursue his studies with less discomfort. Now, in these more difficult times, industry and trade are taking a more active interest in the technical education of their recruits and are apt to regard the student—even if he does not so regard himself—as being engaged in what is becoming a corporate attempt to restore the prosperity we have lost.

THE DIRECTION OF CHANGES IN INDUSTRY

There are other changes in industry besides a diminution of prosperity, and still more changes are imminent.

This country became wealthy during the nineteenth century because she was engaged in making and selling on an enormous scale goods which, at that time, other countries either could not, or did not, make for themselves or for others. If it is to reach its former degree of prosperity through industry and trade, it will be by developing once more to a very high degree the ability to make and sell goods needed by other countries, which they are not in a position to make with profit to themselves. This cannot be done without a continuous advance in our methods of treating the raw materials of manufacture, putting more skill and more work into the same weights of these materials.

An interesting example of what has been done to increase the value of raw materials by increasing the amount of skill and time devoted to their conversion into finished goods occurs in South Staffordshire. For many years the population of the 'Black Country' were engaged in the heavy iron industries, for which the raw materials—iron ore, coal, and fireclay—were obtained locally. When the supplies of iron ore failed, the heavier industries began to move to the coast to be within reach of sea-borne supplies of raw materials, and the Black Country had to import from other districts iron ore for that part of the heavy industries which remained. Fortunately the district had developed secondary metal industries. It had long been accustomed to convert the iron and steel produced as plates and girders into bridges, that produced as rods and bars into nuts, bolts, and nails, and that produced as sheets into locks, buckets, and traps for animals, each particular area in South Staffordshire devoting itself to one or more secondary industries of this kind. With the gradual movement coastwards of the heavy trades, the local

manufacturers—as well as men from other districts—looked round for some means of employing profitably the population, skilled in metal working by generations of experience, and began to develop tertiary industries, such as electrical engineering, motor-car and aeroplane manufacture, and general engineering, with the result that the Black Country, which might have become derelict, entered upon a fresh era of prosperity. All this was done by private enterprise, with no guidance or support from public sources or, indeed, any co-operative plan. The history of this industrial region during the last thirty years is full of encouragement for the country as a whole, since it indicates very clearly one direction in which the difficulties which confront us may be diminished.

It is very significant that in Belgium there is a definite attempt at movement in the direction taken years ago by South Staffordshire. M. Heyman, Minister of Labour in Belgium, writes in a brochure with the title *L'Enseignement Technique en Belgique*:

'We live on exports in a small over-populated country, raw materials come to us, in a very large measure, by importation· our only resource is to transform these raw materials and to export the manufactured goods. Statistics show us that our exports are heavy, but of small specific value—cast iron, steel, rails, cement. . . The markets of the world demand novelties. These are causing the disappearance of the old order, so that if we do not produce more than we have done, a crisis, of which no one can foresee the consequences, will be inevitable.'

M. Heyman points out very eloquently in his brochure that the successful adoption of the industrial policy he advocates is impossible without a high degree of technical skill amongst the various categories of

workers and stresses the importance of technical education.

THE IMPORTANCE OF INDUSTRIAL RESEARCH

Technical education is not, however, the only factor needed for this policy. There must be systematic and continuous research on the qualities of raw materials and the most effective and economical methods of converting them into marketable goods. This country, through the work done with Government assistance in the various research stations carried on by the Department of Scientific and Industrial Research, in the Research Associations established by some industries and aided by this Department, in universities and in the laboratories conducted by industry itself, is in a far stronger position for carrying on scientific research into industrial problems than it was in 1918. Over a wide field, the means of research have been provided on a scale which is generally adequate for present demands, and the scientific investigation of materials and processes is proceeding systematically. Indeed, in some branches of industry, whose dependence on the application to their practice of science is only now being realized, new knowledge is being gained more rapidly than it can be utilized No one can regard such a state of things with equanimity There is no doubt that if the universities had not developed their great schools of physics, chemistry, and engineering, and thus ensured a supply of men trained in scientific method, there would have been a serious dearth of men qualified to carry on industrial research. As it is, the defect is not there, but in industry itself, where in many branches there is no tradition of employing university graduates or men with wide scientific knowledge and training. In

these branches, there is no real hope of applying on any adequate scale the new knowledge gained by the various research organizations until the qualifications of the men at the top have been improved.

In my view, one of the greatest needs at the present time of the industries of the country is not so much an increased supply of research workers as clearer realization of the absolute necessity for the employment in the works themselves of highly trained scientific men, who can decide at once whether and how a new piece of knowledge can be utilized there; whether its utilization is likely to result in a permanent profit; and whether a difficulty encountered in the day-to-day practice of the works is one they should overcome for themselves or one to be referred to their research organization, either because of its general interest or because of its demanding greater facilities for research than are at their own disposal. To put the matter briefly, industry has now, speaking generally, a research organization which is reasonably adequate for existing needs. What is needed is a supply of liaison officers between the research laboratory and the works, who are not detached from the firms themselves, but form part of its ordinary staff, often acting in the capacity of works managers. The larger firms and the amalgamations of firms are in a position to employ such men, and a number of them do so in the industries where the complete dependence of workshop practice on science is obvious.

THE DIMINUTION OF VERTICAL MOBILITY IN INDUSTRY

In other industries, where the utilization of science is more recent and its value is only partially recognized, such men are not often employed. One difficulty in

the way of appointing them is that the older industries have traditional methods of recruitment and staffing which are not easy to modify. At a time when recruitment was almost entirely from the elementary school, most of the responsible posts of every grade were necessarily filled by men who had started very near the bottom of the ladder and had raised themselves by their own diligence and capacity. There has been, in fact, very great mobility of labour in England. It will not completely disappear, but it is obvious that in present circumstances it will diminish, since the conduct of modern industry demands for success the services of men who have not entered the works in a humble capacity at the age of fourteen and made their way upwards by their own efforts, aided by study during their scanty leisure, but have had a broad general education, on which they have built a first-rate scientific education.

THE QUALIFICATIONS OF THE HIGHER STAFF

Some of them will have been trained in universities, and will thus not enter the industry until they are about 21 or 22 years of age; it is from these that the research workers will, as a rule, be drawn. Others will have left a secondary school at the age of 16 or 17, and have spent three or more years in the works, with a liberal amount of free-time for attendance at day-classes in a technical school and for private study. These will be the works managers of the future. By early contact with works problems and with workmen, they will understand thoroughly the atmosphere of the works and will be able to decide what is practicable and what is not; and by prolonged part-time attendance at school, under good conditions, concurrently with their works

experience, they will have gained a good scientific education.

THE CHANGE IN THE NATURE OF INDUSTRIAL SKILL

So much for the managers of industrial concerns and other officials with very heavy responsibilities. While these men must in future be far more adequately equipped for their more difficult task, their work will be sterile unless they are able to rely on the services of competent foremen and skilled workmen. It is often stated, almost as an axiom, that the need for skilled craftsmanship is disappearing, since the skill of the craftsman is being rapidly transferred to the designer and maker of the machine, which does, more accurately and more expeditiously, the work he formerly undertook. This statement cannot be accepted without careful investigation, since its acceptance, if it is not fully justified, would lead to a diminution of our ability to produce goods of high marketable value. Fortunately the question has been carefully investigated by Mr. C G. Renold,[1] in a paper on 'The Present Position of Skill in Industry', which he contributed to the *Economic Journal* in December 1928. Renold, after a consideration of the development of his own firm (which is engaged in the making of chains), comes to the conclusion that the proportion of persons needing skill is not changing very quickly, though the skill employed is of a different kind. He divides the evolution of engineering operations into several stages:

(*a*) At the outset, work is dependent on the manual skill of a craftsman.

(*b*) A machine or tool is developed which replaces the skilled movements of the craftsman by movements

[1] *The Economic Journal*, December 1928, p 593

controlled by mechanism; the operator must be able to set and operate the machine for a large variety of work 'This stage also involves considerable skill, but a skill containing more of the elements of knowledge and judgement than of physical dexterity.'

(*c*) The next stage is to split up the operations done on the universal machine into elements, and to have a single-purpose machine often, though not necessarily, automatic, to do each. Such a machine is manned by an unskilled operator. It must be noted, however, that at this stage various new kinds of skill are brought in and are exercised by individuals in ancillary services. There is the 'setting up' of the machine, the keeping of it in repair, the separate inspection of the work, &c.

(*d*) Splitting up a job into a number of elements, each performed on a single-purpose machine, involves a great deal of immediate handling, and to eliminate this, more elaborate machines are developed which combine several elementary operations and are fully automatic. While, even at this stage, the machine may be operated by an unskilled man, it is much more likely that only highly skilled operators will be employed, who will have not only to work the machines, but to keep them in adjustment. In this case, the unskilled portion of the labour concerned with the process has been practically eliminated. On the other hand, if an unskilled operator is still employed, his work is so simple that he will look after a whole battery of machines, and the number of such men will be greatly reduced compared with the increased numbers engaged on the more skilled ancillary services. Looking at the tables of figures accompanying the paper, Renold points out that the striking movements which had taken place between 1913 and 1928 are (1) the growth of the craftsman category, the

proportion having increased from 10·3 per cent. to 15·9 per cent. (2) The reduction in numbers of both semi-skilled machine operators and unskilled labourers, the proportion of the former having fallen from 17 per cent. to 11·6 per cent, and of the latter from 21 8 per cent. to 10·8 per cent. (3) The reduction of the numbers of 'Upper Staff' and 'Male Clerical' workers, the former having dropped from 5·7 per cent. to 3·2 per cent, and the latter from 11·9 per cent. to 4·3 per cent. (4) The great increase—from 27·2 per cent. to 49 per cent.—in the number of women employed during the fifteen years from 1913.

While the inquiry undertaken by Renold was in respect of only one works in a single industry, there is no doubt that his results are of wide application, and that what has gone on there will go on in other works and other industries. The old kind of skill is being replaced by a new form of skill, based on considerable intelligence, a sound general education, a willingness to develop fresh interests, and an ability to adapt oneself easily and completely to fresh tasks Qualifications of this kind will be needed in a far greater proportion of the population than the qualification of being able to carry out one special series of operations, although this latter will not disappear. A question we, as a nation, have to decide is how we are to obtain this general skill and this great flexibility throughout the population, and how we are to make certain that it will always be available in sufficient volume for our industrial needs; another question is as to the method of preserving the supply of men with special kinds of skill.

THE TRAINING OF SKILLED WORKMEN ON THE CONTINENT

These questions, or others like them, are being keenly discussed in every industrial country of Europe; and, generally speaking, these countries are doing their best to create a skilled rank and file for their industries by organizing trade schools for boys and girls who have just left the elementary school, and sending through them nearly all those who wish to become skilled artisans and foremen. In France every employer who is not satisfying the authorities that he himself is providing a complete all-round training for his apprentices is compelled to pay a *taxe d'apprentissage* of two francs for every thousand francs of wages paid to his workers; the product of this tax is devoted to technical education, mainly that of apprentices. In Belgium there are 600 full-time trade schools, with about 85,000 pupils, teaching specific trades to boys, and 150 part-time schools, with about 35,000 pupils, which aim at enabling skilled workmen to become foremen. In Czechoslovakia apprenticeship—either by full-time attendance at a trade school, or by part-time attendance during working hours throughout the three years of apprenticeship—is compulsory on every one who wishes to be recognized legally as a skilled workman. In Holland there are 81 trade schools for boys, with about 20,000 pupils, and all of these have been initiated as the result of private enterprise, though they are subsidized by the State when they comply with the conditions laid down.

THE TRAINING OF SKILLED WORKMEN IN ENGLAND

We in this country are faced now with the problem of deciding whether we ought to devote our attention to

training the rank and file to be intelligent and adaptable, without possessing specialized skill such as that of the craftsman of former times; or whether we should follow the example of the countries mentioned in the preceding section and impart to them a very thorough, but somewhat narrower range of skill in separate crafts; or whether, indeed, we should adopt both methods of training for different categories of workers.

Looking at the direction in which industry is tending, there can be no doubt that there will always be need for craftsmen skilled in using either hand tools or simple machines for the manufacture of goods which have to possess individual characteristics of their own in order to find a market; but, in the same community, it will be necessary to have also a number of workers skilled in the use and adjustment of machines which produce goods on the large scale and are becoming more and more complicated. It is probable that the proportion of the former type of workers is diminishing and of the latter type increasing.

So far as the training of the first type is concerned, the right plan appears to be to increase the number of trade schools. These scarcely exist outside London—where they are carried on with great success—but they might well be established in other centres of industry. I ought to repeat, however, that when any proposal to set up a trade school is made, great care is necessary to see that the trade it teaches is one which has the element of permanence, since there is nothing so unsatisfactory to a boy or girl as to spend some years in acquiring skill and knowledge which afterwards become useless

As regards the second type, no special provision of *technical* education appears to be needed The Senior elementary schools, at any rate in the urban areas of

the country, are already providing a kind of education in which attention is paid to manual instruction; and I have no doubt that this form of instruction, which has been given for many years, has been of service to British industry. What is needed is an increase in the amount of time spent in manual work, and the extension of this to materials other than wood and iron. It would certainly be of advantage to add to the range of materials, to associate the manual work more fully with calculations and drawing, to give to the pupils exact notions of the value of their raw materials, the finished articles they produce, and especially of the time it takes to produce them, and finally to arrange for groups of pupils to co-operate in making articles—or even small buildings—where each of them is fully responsible for a particular piece of work being carried out satisfactorily.

In my view, the general adoption of such a plan as this would result in maintaining the traditional skill of the British workman and would enable him to undertake fresh tasks and to face new conditions both with confidence and with the satisfaction that comes to a man with the ability to do a piece of work well.

THE FUNCTION OF THE JUNIOR TECHNICAL SCHOOL

I have discussed the part to be played by the trade school and by the Senior elementary school in the training of the skilled workman of the future. What part is played by the Junior technical school, an institution which is more vocational in aim than the elementary school and less vocational than the trade school? I am fairly sure that its function in the future will be even more important than in the past. It gives a general education more prolonged than the elementary school, it devotes a great deal of attention to sound training

in science and mathematics, and it affords opportunities for gaining skill in manual and machine operations. For these reasons, it seems likely that it will in the future be a school from which a considerable proportion of the foremen will be drawn Already it is providing a number of such responsible workers for the constructive industries of engineering and building, but since industrial research must ultimately have the effect of making other industries than these more and more dependent on science, it seems probable that the Junior technical school will sooner or later be the source from which these industries will also recruit those of their personnel who, without having a very long preliminary education, do need some knowledge of science and scientific method.

THE PRESSING NEED FOR A POLICY OF INDUSTRIAL RECRUITMENT

Since the methods of industrial recruitment are based, as a rule, on educational conditions which have disappeared, and not on the greatly improved conditions of the present, it is imperatively necessary that they shall be overhauled and amended where necessary. Each industrial organization should consider carefully, first, what types and grades of workers it needs, and in what numbers: and, second, from what types and grades of schools these should be drawn. Every industry, should, in fact, devise a policy of recruitment. While such a policy is desirable, and even necessary, in modern industry, its adoption in a rigid form, and its execution with mechanical precision, would be attended with grave consequences. It should therefore be sufficiently elastic to take proper account of the charac-

teristics, the motives, the traditions, and the ambitions of the human beings whom it concerns.

It is not sufficient, however, to have only a recruiting policy for selecting suitable recruits; with this policy should be associated a definite plan of training and promotion, in which the exact function to be performed by the schools has been determined.

I am well aware that a suggestion that the time has come for a complete review of our methods of industrial recruitment, training, and promotion may be regarded as impracticable and even visionary. But it is necessary for industry to face the facts. We know that some industries which ought to be making use of the scientific knowledge now available for them are not able to do so fully because they do not employ enough men with the necessary wide and thorough scientific training, to some extent, therefore, these industries are falling short of complete efficiency.

The standard of life in England is generally higher than that of many of our neighbours. In a crowded industrial country it can be maintained in one way, and in one way only; that is, by manufacturing and trading successfully in a world filled with competitors. If we cling to our traditional methods of recruitment and training, while our competitors abroad adopt every possible means—as many of them are doing—for securing an adequate and appropriate training for every grade of industrial worker, from the highest to the lowest, there can be only one result. Our trade will decrease and our standard of life will diminish.

We are, in fact, at a great crisis in our history. We look back at the Industrial Revolution, which took place a century ago, and we see how vastly it affected, first of all this country and then the whole of central

and western Europe A world that had been static became dynamic. But, clearly as we see the movement of that Industrial Revolution, it is not as easy to see that we are now in the midst of another Industrial Revolution, whose results will doubtless be at least as great and as far-reaching as those of the first. Moreover, with the development of better means of transport and communication, they will come upon us more swiftly. At such a crisis, it would be foolish and even disastrous to allow old traditions or prejudices to stand in the way of equipping industry and commerce to face the difficulties which confront them. If the present methods of selecting and training recruits for industry and commerce are not the most suitable, we must be ready to replace them by better methods; and in the task of devising and adopting these methods, industry and commerce can rely with confidence on the zealous co-operation of the schools and of those responsible for them.

CHAPTER XVIII

PART-TIME EDUCATION IN DAY CLASSES

THROUGHOUT the preceding chapters, I have emphasized the importance of employers setting free their younger employees for one or two half-days a week in order that they may receive suitable instruction in technical schools. That they should do so, on a far larger scale than at present, is not merely desirable; it is just and reasonable. So long as students were individualists, working for their own advancement, they could quite properly be expected to give up their leisure time to study, without making any demand on their employers for 'time off'. In the circumstances which then existed, there was no logical reason why employers should put themselves to inconvenience and loss, either by allowing machines to stand idle or by rearranging the routine of their works

As soon, however, as employers and others began to regard technical students as young men who were equipping themselves for playing an effective part in the fierce struggle to secure once more the prosperity of industry and trade, and through this the welfare of the whole nation, the circumstances became completely different. It is no longer fitting that young men who are taking part in a great corporate effort to raise the general standard of life in the country should be called upon to shoulder a greater proportion of the burden than that borne by older and more mature workers; and undoubtedly to call upon a youth to do a full day's work and, when that is finished and he is tired out, to spend practically every evening in study either at school or at home, is asking him to undertake more than his

fair share of what we all know is a general responsibility. The release from employment of young men—selected for the promise they show—in order that they may attend classes on one or two half-days a week is no longer an act of philanthropy, but an act of justice. It divides the burden which lies on all of us in a reasonable way. It assigns to the employer the loss he suffers through being deprived of the services of some of his best recruits for six or eight hours a week; to the student the sacrifice of some of his leisure, for it is not suggested that he shall altogether discontinue his attendance at evening classes in his own time, though he will attend less frequently; and to the community as a whole the responsibility for establishing and maintaining the schools.

THE COST OF ADDITIONAL PART-TIME DAY CLASSES

It is necessary to inquire carefully into the cost of transforming part of the present evening attendance at technical schools into attendance during the day-time; and one of the first matters for investigation is whether additional buildings and equipment would be needed.

No one who visits a technical school on a winter evening can fail to be favourably impressed by its business-like activity. The classrooms, laboratories, and workshops are filled with eager students, too busy to look up from their work to notice the visitor. There is no room unoccupied, and in some schools classes are being taught in rooms, or even corridors, which were never intended for instructional purposes. But few persons who visit the same schools during the day-time will come away without a feeling of depression at seeing so much valuable space and equipment left unused during the hours of daylight, the best hours of all.

There is certainly room for considerable expansion of the day work of the technical schools during the day-time without any expenditure whatever on buildings and equipment. It would be possible, by a detailed investigation at each school, to make a fairly exact estimate of the amount of accommodation available; but such an investigation would be lengthy; and a rough estimate which is probably sufficiently accurate for many purposes can be made in another way.

The following calculation takes no account of those technical schools in which an elementary or a secondary school is carried on; only the technical colleges and schools are included.

A is the total number of evening students in all the schools.

B is the total number of full-time students in these schools.

C is the total number of part-time day students in the schools.

Since evening students attend for not more than three of the five nights the school is open during the week, the number present on any one evening does not exceed $0{\cdot}6\,A$; but in order to be on the safe side, and not to give too high a figure for the accommodation, I have taken $0\,45\,A$ (i.e. rather less than half) as the number of places occupied on any evening; this gives us the total accommodation of the school.

B is a figure which is exactly known.

Some part-time students attend for one half-day, others for two half-days, and others for more than this. In order to obtain a figure which is safe (since it is an over-estimate), I have assumed that the part-time students are in attendance for half the week. On this basis, the space they occupy is represented by $0\,5\,C$.

The accommodation vacant will thus be represented by the formula $X = 0\,45\,A - B - 0\,5\,C$.

The actual number of vacant places, as calculated from this formula, for all the technical schools in the country is about 37,000. We cannot regard the accommodation of a school as being available for a morning, an afternoon, and an evening on every day in the week, but if we assume that it can be used for four additional sets of students, the total number of such students would be about 150,000.

It is, however, to be taken into account that students often travel a considerable distance in order to attend evening classes. If release from employment were for a whole day in the week, they could reasonably be expected to travel just as far as they do in the evening; if it were for separate periods on different days, it would obviously be difficult for those living at a distance to travel as far as they do now. This factor is quite material in the calculation, since it diminishes the number of places available.

As regards other expenditure, the heaviest would be the salaries of the full-time teachers who would have to be added to the existing staffs; against this would be set off the savings due to the employment of a smaller number of part-time teachers of evening classes, since there would be a considerable diminution of the number of students attending these.

While it is clear that the financial aspects of any proposal to increase greatly the volume of day attendance as a substitute for part of the evening attendance would have to be examined very carefully, it is by no means certain that the additional expenditure would be great. It is, however, quite certain that the educational advantages would be very great.

CHAPTER XIX

CO-OPERATION BETWEEN INDUSTRY AND COMMERCE AND EDUCATION

THE NECESSITY OF CO-OPERATION

IT is clear that the framing and carrying out of a definite policy of recruitment and training for the personnel of industry and commerce demands close co-operation with schools and those responsible for them. This is of special importance in this country, where technical education is under the same direction and control as elementary and secondary education, both locally and centrally. It is essentially part of the educational, and not of the industrial system, as it is in some other countries. Accordingly, special means must exist for keeping it in living contact with industry and commerce. If these means do not exist, or if they fail, there is a serious risk that technical education will be sterile and will contribute little of real value towards the prosperity of the country. For many years they existed only partially and very incompletely, but happily there are now abundant signs of fruitful co-operation between educational and trade organizations.

This co-operation may be local; that is, it may consist of arrangements for joint consultation between a school, a Local Education Authority, or a group of neighbouring Local Education Authorities, and persons or organizations engaged locally in trade or industry. It may, on the other hand, be national; that is, it may exist between the Board of Education (or some other national organization interested in education) and the national organizations of employers, employees, or

professional men engaged in particular branches of trade or industry.

LOCAL CO-OPERATION

Since the Local Education Authority is the County or County Borough Council, a popularly elected body, there is no guarantee that the interests of even a small proportion of the branches of industry or commerce carried on within its area will receive enlightened consideration from it. To care for all of them adequately and in detail would usually demand so great a representation of industry and commerce on the Education Committee of the Authority that the Committee, as a whole, would tend to lose that control over the schools which is entrusted to it by statute.

The difficulty is minimized in many areas by the appointment of Advisory Committees, representative, as a rule, of both employers and employed, which keep in touch with the several departments of the technical school. They do excellent work by ensuring that the school and its activities maintain contact with realities. Although Advisory Committees thus play an essential part in the system of technical and commercial education, too much should not be expected of them. Like other organizations, they can deal effectively with matters coming within their own knowledge and experience; but their experience of education is limited. They are unable, for example, to draw up syllabuses of instruction; this duty falls within the province of the teachers and should be left to them. It is not, however, suggested that Advisory Committees should refrain from concerning themselves with curricula and syllabuses, since it is their task to inform the schools what knowledge and what qualities they require in their recruits and, in

fact, to draw up a specification of these. It is the task of the teachers to devise means for meeting this specification and, while they are doing this, the Advisory Committees should be associated with them, but holding a watching brief to see that their specification is thoroughly understood and properly met, rather than taking an active part in what is most certainly a piece of work needing expert knowledge and experience of teaching.

The duties which Local Advisory Committees perform include one or more of the following:

'The visiting of classes, the discussion of curricula and staffing, the organization of lectures, the arranging of visits to works by students, the award of prizes, the gift of equipment, the encouragement of attendance, the consideration of reports made by Inspectors, the circularizing of trade organizations, the securing of materials and equipment (either free or at special prices), and the placing of boys in employment.

'At the present time, the Advisory Committees already established in different areas represent the following branches of trade and manufacture: Building, furniture making, printing, pharmacy, painting and decorating, pottery manufacture, engineering, textiles, plumbing, the gun trade, boot and shoe manufacture, leather manufacture, tailors' cutting, commerce, the meat trade, various artistic industries, the grocery trade, and mining. It will be seen, therefore, that there is no considerable branch of trade or industry which has not at some place or other in the country a local Advisory Committee working in connexion with its technical school.'

NATIONAL CO-OPERATION

Until recently, for reasons explained elsewhere, there was little co-operation on the national scale for the furtherance of technical education. The technical schools were managed locally, and obviously the early growth

of co-operation would be between individual schools and local firms or associations, which included amongst their members old students who still retained a keen interest in the schools where they themselves had received their technical education

It was not that there were not in existence national bodies suitably constituted for the purpose of co-operation. On the educational side there were the Board of Education, the various Associations of Education Committees, the Association of Principals of Technical Institutions, the Association of Teachers in Technical Institutions, and the Association of Technical Institutes, each of them constituted on a national basis.

On the side of industry and commerce there were the professional Institutions, the City Companies of London, the associations of employers and the trade unions; to these have now been added the Research Associations and the Joint Industrial Councils

There were thus in being all but one of the factors which are necessary for effective co-operation on the national scale for the development of technical education. The factor that was not present was a strong force impelling the various organizations to act together. This was essential. It has only been operative since the country has had to consider what means shall be employed for regaining its former prosperity. The progress made in the last few years is notable; but there is need for still further co-operation. Even yet, it is not generally believed that technical education can play a most important part in the struggle to increase the national well-being; or, if this belief is accepted, it does not generally lead to energetic action.

THE PROFESSIONAL INSTITUTIONS

These institutions are amongst the oldest national bodies concerned with industry and commerce. Founded as they were for the purpose of establishing and maintaining standards of professional attainment and conduct amongst their members, they have always had an interest in technical education. It is only recently, however, that this interest has manifested itself in the form of organized co-operation with the Board of Education in the award of the 'National Certificates' described in Chapter VIII; it has already, however, proved of great value.

THE CITY COMPANIES

Certain of the City Companies, including the Armourers and Braziers, the Carpenters, Clothworkers, Cordwainers, Drapers, Grocers, Leathersellers, and Stationers, have a traditional interest in technical education and have long been benefactors to schools and students. Most of them give prizes or scholarships to deserving students; some, like the Clothworkers, have made grants in aid of the building of technical schools; and others, like the Leathersellers and the Cordwainers, are responsible for the maintenance of schools of their own.

The City and Guilds of London Institute was founded by a number of them more than fifty years ago and is still exercising a most useful influence on technical education. It has, in particular, established a large number of Advisory Committees in connexion with its examinations, each Committee being composed of representatives of schools and Education Authorities as well as of the particular branch of industry with which the Committee is concerned.

INDUSTRIAL RESEARCH ASSOCIATIONS

During the War the Government decided to help industries to set up organizations for carrying on co-operative scientific research on their problems. About twenty-five Research Associations were accordingly established in connexion with different industries, and each of them receives from the Department of Scientific and Industrial Research an annual grant proportionate to the amount of money contributed to it by the industry. Since the Research Association is concerned with the gaining of knowledge and with its dissemination and utilization, its function is closely connected with education. This has been recognized from the start. The provisional committees of industrialists which set up the Research Associations for the Cotton and Wool industries, respectively, included in their surveys reference to both research and education. Every Research Association has taken powers in its memorandum of association 'to aid and encourage the education of persons engaged or likely to be engaged in the said trade or industry'. In view of this fact, it is a matter for regret that only two Associations —those for the Cotton and Wool industries—have established Education Committees and devoted systematic attention to technical education.

The Education Committee of the Cotton Industry Research Association, after a preliminary exploration of the ground, decided to nominate representatives on a 'Joint Standing Committee (Industry and Education)'. An invitation to nominate members of this committee was accepted by the Local Authorities of Lancashire, Blackburn, Bolton, Burnley, Manchester, Oldham, and Rochdale. The object of the Committee is to consider

the methods of training (*a*) in works, and (*b*) in schools young people engaged in occupations of various grades in the industry. One of the most interesting inquiries it has made related to the training of designers, in which it was greatly helped by an investigation of the methods of training designers on the Continent, which was undertaken by two Inspectors of the Board of Education nominated to serve as 'assessors' to the committee.

The Education Committee of the Wool Research Association co-operates with the Joint Industrial Council for the industry and acts as an Advisory Committee of the City and Guilds of London Institute in respect of examinations in wool subjects.

JOINT INDUSTRIAL COUNCILS

The Joint Industrial Councils for the different industries, constituted of equal numbers of employers and employed, have very wide terms of reference, since they were established to devise means for the smooth and efficient conduct of the industries. While advising about education is certainly one of their functions, it is only one among many others, and accordingly it is only rarely that this function has been actively performed. Amongst the Joint Industrial Councils which have considered technical education for their industry are those concerned with heating and domestic engineering, flour milling, hosiery manufacture, and the plastering, pottery, printing, and silk industries.

The Joint Industrial Council for the plastering industry has drawn up a model scheme of apprenticeship providing for the release of apprentices during the day in order that they may attend school, as has also that for the printing industry. The latter body was recently of great assistance to the Board of Education

in connexion with an inquiry into education for the printing industry, which is of special importance, since it includes reference to the artistic as well as to the technological side.

The Joint Industrial Council for the flour milling industry advises as to curricula, and has interested itself in the supply of text-books and trade journals for the use of students of this branch of technology.

THE ASSOCIATION FOR EDUCATION FOR INDUSTRY AND COMMERCE

This association is representative of a number of important firms which have a keen interest in technical education. It has done excellent work in surveying the educational needs of responsible workers of various grades and has published very useful reports.

THE BRITISH ASSOCIATION FOR COMMERCIAL EDUCATION

This organization was established as a consequence of the publication of the reports of the Government Committee on 'Education for Salesmanship'. Its aim resembles closely that of the Association for Education in Industry and Commerce, since it brings together representatives of both education and commerce for the study of common problems; it differs from it, however, in concerning itself with education for commerce unassociated with manufacture.

THE REGIONAL ORGANIZATION OF TECHNICAL EDUCATION

At the present time, every County and County Borough Authority has power to establish and maintain

technical schools within its area, and is not bound, in framing its schemes of technical education, either to consult its neighbours or to take any account of the provision they are making. Nevertheless, there is amongst adjacent Authorities a good deal of consultation and an increasing amount of co-operation; this is all to the good, since industries and trades, although sometimes highly localized, normally pay little regard to the existence of local boundaries unless some question of local rates is involved

Generally speaking, the areas of even the largest Authorities are too small, when looked at from the point of view of those concerned with education for industry and commerce.

One or two examples will make this quite clear. Metal working of one kind or another is the main industry of what is sometimes called the 'West Midlands', that is, South Staffordshire, North Worcestershire, Birmingham, and Coventry. There is one common educational interest amongst all the technical schools of this important area—that of supplying this industry, or rather, this group of allied industries, with competent workers of all grades; yet the work of planning and carrying on technical education is entrusted to no less than nine separate Education Authorities: that is, Staffordshire, Worcestershire, Birmingham, Dudley, Wolverhampton, Walsall, West Bromwich, Smethwick, and Coventry.

Again, the responsibility for commercial education, as well as other forms of technical education, in Lancashire and Cheshire is shared amongst two County and fifteen County Borough Authorities, whereas the commercial interests of this great area, if not identical, have very much in common. The real area for the

administration of commercial education here is that from which men come to do business in the great mercantile Exchanges of Liverpool and Manchester, though it is not, of course, suggested that every one of these men would have benefited by attendance at commercial classes.

Other instances, drawn from different parts of the country, might be given to illustrate the manner in which individual problems, which ought to be treated singly and comprehensively, are being tackled by a multitude of Authorities, each of them willing, no doubt, to co-operate with its neighbours, but unwilling to cede anything of its own autonomy. To have such a multiplicity of administrative bodies, each dealing with part of a problem and none of them seeing it as a whole, is not an efficient form of organization; moreover, it is extravagant.

It has become now axiomatic that the future welfare of technical education depends on the co-operation of trade and industry, on the one hand, with education, on the other. If, however, Education Authorities are to co-operate fully and effectively with industrial and trade organizations, each covering the whole of an industrial region, they must do so on terms of equality; this is the first condition of true co-operation. At the moment, this condition is not satisfied, since the Education Authorities are, on the whole, acting independently, while each of the trade organizations is in a position to act in any particular region as a single unit.

It is true that something has been done to bring about a greater degree of co-operation than formerly existed. The regional examining unions of Authorities have done a good deal to unify the syllabuses and curricula of those technical schools which adopt their schemes, but these

unions do not, in any instance, include all the technical schools in the region where they have been set up. In Lancashire, there is a plan for the co-ordination of the advanced instruction in pure and applied chemistry; and in Yorkshire, the Yorkshire Council of Further Education has done valuable work in co-ordinating the activities of the fifteen Authorities which have statutory powers to provide technical education.

As yet, however, regional co-operation is only in its early stages. If the country is to have a real system of technical education, completely adapted to modern needs, the Education Authorities of each of the great industrial regions must act together solidly as a single unit of organization. Co-operation amongst them must not be sporadic or casual. It must be comprehensive, including all the Authorities in the region, and affecting all grades and types of technical and commercial education; further, it must be permanent and not liable to capricious modification or discontinuance. The question we have to decide—and that quickly—is whether all these conditions can be secured by the voluntary adhesion of the Authorities in each region to a common plan agreed upon amongst themselves; or whether it will be necessary to ensure by legislation that they do exist. There is no doubt that schemes for the regional co-ordination of technical education demand that some Authorities shall undertake greater responsibilities than they do at present, and that others shall undertake smaller responsibilities than local patriotism would suggest Our experience, so far, does not encourage the belief that these disadvantages will be accepted readily by Authorities who do not realize the imperative necessity of joint action for a common end. Once they do realize it, we may hope that they will either co-operate

voluntarily and fully for the improvement of technical education or that they will welcome legislation defining their several functions in a single scheme, none of them lagging behind the others, and all of them recognizing that the interest of each is the interest of all.

APPENDIX

THE GROWTH OF AN IMPORTANT SCHOOL

An instance of the way in which schools have acquired their present buildings and status may be of interest.

In 1848 a number of London clergymen met at Crosby Hall, under the Chairmanship of the Rev Charles Mackenzie, and constituted themselves into the 'Committee of Management of Evening Classes for Young Men in London'. They started by organizing classes in various parochial schoolrooms (always after obtaining the approval of the incumbent), and also at Crosby Hall and at the Beaumont Institute, Mile End Road

In 1851, in spite of some vicissitudes, the classes, distributed at first over a wide area, were so successful that a scheme was put forward for the establishment of a Library, Reading-room, and a Coffee-room at Crosby Hall, where the classes were gradually centralized During the next two years the number of young men in attendance increased, and the movement received the encouragement of H R H. the Prince Consort

In 1859 the Committee, finding themselves unable either to buy the lease of Crosby Hall or to pay the rent asked for it, decided to transfer the classes to Sussex Hall, the hall of the Bricklayers' Company in Leadenhall Street, which, after being for some time let by the Company for the purposes of a Literary Institution, was now for sale; it was not bought by the School Committee, but hired from the purchaser. Classes were opened in Sussex Hall in 1860, and in 1862 the 'City of London College' was founded there Over a thousand students enrolled for the session of 1862–3

In 1881 Sussex Hall had become too small for the volume of work carried on by the College, and it was decided to move the institution to its present site in White Street, funds being raised for new buildings from merchants, City Companies, the Corporation of the City of London, the Bank

of England, and the City churches. The building was ready in 1883, and was opened in that year by H.R.H the Prince of Wales.

In 1891 the City Parochial Foundation began to make an annual grant to the College of £1,000, which placed it on a more satisfactory financial basis. In the following year the London County Council made a grant to the College from the 'whisky money', and has continued ever since to contribute towards its maintenance

In 1905 a new wing provided from funds raised by subscription in the City was opened by the Marquess of Londonderry The building was completed in its present form in 1928, and opened in that year by Lord Eustace Percy.

The modification of the aim of the school, which was originally intended 'to improve the intellectual and moral condition of the industrial classes', began in 1856 with the starting of a course of lectures in Banking. It has proceeded gradually, receiving an impetus through the adoption in 1905 of a scheme of co-operation with the London Chamber of Commerce in the work of commercial education, until now, when the College devotes its whole energies to the furtherance of commercial education and, as is fitting for an institution so closely connected with the City of London, is one of the premier commercial schools of the country.

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